REPORT RESUMES

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REORGANIZED SCIENCE CURRICULUM, 2, GRADE TWO SUPPLEMENT.
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THE THIRD IN A SERIES OF 17 VOLUMES, THIS VOLUME PROVIDES THE SECOND GRADE TEACHER WITH A GUIDE TO THE REORGANIZED SCIENCE CURRICULUM OF THE MINNEAPOLIS PUBLIC SCHOOLS. THE MATERIALS ARE INTENDED TO BE AUGMENTED AND REVISED AS THE NEED ARISES. A CHART INDICATES CONCEPTS TO BE TAUGHT IN GRADES K-3, IN EACH OF THE FOUR AREAS AROUND WHICH THE PROGRAM IS ORGANIZED. THE AREAS ARE (1) THE EARTH, (2) LIVING THINGS, (3) ENERGY, AND (4) THE UNIVERSE. AT PRESENT THE RESOURCE UNITS SECTION OF THE SUPPLEMENT INCLUDES A UNIT ON ENERGY. OTHERS WILL BE ADDED AS THEY BECOME AVAILABLE. COURSE CONTENT FOR K-12 IS GIVEN IN CHART FORM. IN ADDITION TO THE INTRODUCTORY MATERIAL, SECTIONS OF THE SUPPLEMENT ARE (1) CONCEPTS, (2) RESOURCE UNITS, (3) ANNOTATED BIBLIOGRAPHY, BOOKS, (4) ANNOTATED BIBLIOGRAPHY, FILMS, AND (5) EQUIPMENT AND SUPPLIES. (DH)

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THE GRADE TWO SUPPLEMENT

to the

REORGANIZED SCIENCE CURRICULUM

Kindergarten Through Grade Twelve

(For Discussion Purposes Only)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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INTRODUCTION

This Supplement has been prepared as a convenient reference to assist the second grade teacher in teaching the science content allocated in the Reorganized Science Curriculum. Second grade teachers suggested and assisted with the preparation of each section of this Supplement. Those who have participated in the preparation of this teacher's guide lay no claim to its being "without blemish". However, its value can be determined only by those classroom teachers who use it and make constructive suggestions to improve it. All Minneapolis Public School personnel are invited to cooperate in improving this Supplement in order to make it of genuine assistance to all beginning and experienced second grade teachers. All constructive suggestions should be called in or sent to the Science Department Office.

This Supplement is not complete at the present time. When additional materials are developed, a copy will be furnished to you to place in this loose-leaf binder. Your cooperation with us to keep your Supplement up-to-date will be appreciated. When you leave your school, please leave the Supplement for the next teacher's use.

FOREWORD

Long before that famous October fourth, 1957, when Sputnik I rocketed into orbit, the science teachers of the Minneapolis Public Schools eagerly began work on the reorganization of the science curriculum from kindergarten through grade twelve. This reorganized science curriculum was requested by our instructional staff and developed by representative members of that staff.

The citizen of today must be science literate in order to exercise adequately his duties of citizenship. The contribution of the scientist to our way of life is the methods which he uses to attack a problem and seek its solution. These methods are unique, but more important, they are very useful; they can be applied in the solution of the everyday problem by knowledgeable children at all ages and grade levels, and by adults in all walks of life. If these methods of science are to be learned by the youth of Minneapolis, they must be learned by attacking realistic problems inside and outside the classroom. This practice in the solving of work-a-day problems trains our young citizens to think for themselves in seeking new solutions to age-old problems of our civilization.

In the Minneapolis Public Schools we recognize that science is a very important part of the liberal arts general education which should be studied by all students. We are aware of our responsibility for instruction which must be well grounded in the fundamental laws and principles in all the fields of the basic sciences and therefore propose this reorganized curriculum for teaching the ever-expanding knowledge of science.

This reorganized science curriculum does not teach itself. It is a planned developmental approach in which the teacher is the expeditor and not the limiter of learning. The curriculum has been developed to aid the student in acquiring new breadths and new depths of understanding of his environment; and with it a teacher who is well trained in science may lead the student in an ever-expanding investigation of his surroundings in this world and universe. If the curriculum is used cooperatively by teacher and students, it is an instrument which can mold a pupil of the Minneapolis Public Schools into a science-literate citizen who, if he continues advanced science training, may become a scientist of the future.

CONTINUITY OF SUBJECT MATTER, KINDERGARTEN THROUGH GRADE THREE

Introduction to Science

Kindergarten	Grade One	Grade Two	Grade Three
Science and how we learn about it	Some ways of learning science	Using science	Methods of science
			Tools for measurement of time and direction

I. The Earth

Kindergarten	Grade One	Grade Two	Grade Three
Finding out about our earth	Rocks and soil		Features of the earth's crust
			How soils are made
Seeing differences in materials			
Water		Water appears and disappears	Water is everywhere
Air around us	Air around us		Air is everywhere
			What makes the weather?

II. Living Things

Kindergarten	Grade One	Grade Two	Grade Three
Things that are alive			Things alive
			Protecting and enjoying plants and wildlife
Plants around us	Learning about plants	How plants live and grow	How plants depend on their environment
	Kinds of seeds and how they travel		
How animals are different 1. Body covering 2. Movement 3. Habitat 4. Usefulness	Animals need food	Animal behavior	How animals help us
Enjoying animals	Animals use their senses	Animals have young	Animals live in communities
What our bodies need	Our bodies	Understanding ourselves	Our bodies at work

CONTINUITY OF SUBJECT MATTER, KINDERGARTEN THROUGH GRADE THREE

III. Energy

Kindergarten	Grade One	Grade Two	Grade Three
			Liquids and solids
Simple machines		Things that help and hinder work	Mechanical energy
			Earth's gravity
Magnets are fun		Magnets and what they do	
	What we can learn from sound	How sounds travel	
	Electricity works for us		Effects of current electricity
Keeping warm			Sources and uses of heat
How light helps us	Light and shadows	Light and how it is reflected	

IV. The Universe

We look at the sky	Our star, the sun	What we see in the sky	The sun and other stars
	The earth where we live	Movements of the earth	

Minneapolis Public Schools
Science Department
Rev. 9-5-62

(typed by JW)

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

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SUMMARY OF GRADE-CONTENT ASSIGNMENTS

Area and Major Topics	Grade Level												
	K	1	2	3	4	5	6	7	8	9	10	11	12
Introduction to Science (Gray)	*	*	*	+	*	*	*	+	+	+	+	+	+
A. Attitudes (Including history)	+	+	+	+	+	+	+	+		+			+
B. Tools	+		+	+	+		+		*				+
C. Methods	+		+	*	+	+	+			*			
I. The Earth (Red)	+	+	+	*	*	+		+	*				
A. History of the earth					+				+				
B. Physical features	*	+		+	+				+				
C. Rocks and minerals	+	*			+				+				
D. Soils		+		+	+				+				
E. Water	*		*	+	*			*					
F. Air	+	*		+	*			*					
G. Weather and climate				+		*			*				

Key to symbols -- * major emphasis
+ content to be taught

For discussion purposes only

Area and Major Topics	Grade Level												
	K	1	2	3	4	5	6	7	8	9	10	11	12
II. Living Things (Green)	+	+	+	+	+	+		*			*		
A. Life and life processes	+	+	+	+		*		+			+		
1. Life in general	+			*		+		+			+		
2. Food taking or nutrition		*	*	+		+		+			+		
3. Digestion								+			+		
4. Absorption						+		+			+		
5. Circulation				+		+		+					
6. Respiration						+		+			+		
7. Assimilation								+			+		
8. Oxidation						+		+			+		
9. Excretion				+		+		+			+		
10. Reproduction and growth		*	*	*		+		+			+		
11. Responsiveness	+	*	+	+		+		+			+		
B. Classification	*	+	+	+		*		+			+		
C. Ecology	*	+	*	*	*			+			+		
D. Plant and animal economics	+	+	+	*	*			+			+		
E. Human body	*	*	*	*		*		*			+		
F. Aesthetic values	*			*				+			+		

(continued)

Grade-content assignments (continued)

Area and Major Topics	Grade Level												
	K	1	2	3	4	5	6	7	8	9	10	11	12
III. Energy (Yellow)	+	+	+	+	+	+	+			+		*	+
A. Properties of matter related to energy	+			*			*			*		+	*
B. Sources and conservation of energy	+			+		*				+		+	+
C. Mechanical energy and simple machines	*		*	*			*			*		+	
D. Gravitational energy	+			+			+			+		+	
E. Magnetic energy	*		*	+	*					+		+	
F. Sound		*	*				*			+		+	
G. Electrical energy		*		*		*				*		*	
1. Static						+				+		+	
2. Current		*		*		+				*		+	
H. Communication bands and electronics												+	
I. Heat and infrared radiation	*			*		*				+		+	
J. Light and ultraviolet radiation	*	*	*				*			+		+	
K. High energy waves												+	
L. Chemical energy				+			*			*			*
M. Atomic energy							+			+		+	*

For discussion purposes only

Area and Major Topics	K	1	2	3	4	5	6	7	8	9	10	11	12
IV. The Universe (Blue)	+	+	+	+		*	+		*	+			
A. Earth	+	*	*	*		+			+				
B. Moon	*		*			+			+				
C. Sun	*	*	*	*		+			+				
D. Solar system						+			+				
E. Stars and galaxies	*		*	*		+			+				
F. Space travel		+	+	+			*			*			

ey to symbols - - * major emphasis

+ content to be taught

ote: Conservation and safety must permeate science teaching at all grade levels.

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CONCEPTS

For discussion purposes only   Grade Two

ALLOCATION OF CONCEPTS BY UNIT TITLES

Note: This report presents a list of unit titles, within which the order of the concepts found in the Handbook has been changed to provide a logical teaching approach.

Introduction to Science

Using science

1. Man's environment is studied in science.
2. Science experiences provides knowledge which may enable man to understand an environment.
3. Basic scientific study includes living and non-living things.
4. In science, observations are made with a purpose.
5. In science, accurate recording should follow careful observations.
6. Recorded measurements should be accurate.
7. Science experiments should be well planned and organized.
8. Ordinary household equipment and tools may be used for conducting some experiments.

I. Earth

Water appears and disappears

1. There is always some water vapor in the atmosphere.
2. Clouds are a form of water.
3. Water vapor in the air can condense and return to the earth in the form of precipitation.
4. Water expands when it freezes.
5. Heat evaporates water.
6. Heat can change water from a liquid to an invisible gas.
7. Heat can change ice into water.

II. Living Things

A. Animal behavior

1. Most animals need shelter.
2. A shelter provides protection.
3. Different kinds of animals usually need different kinds of shelters.
4. Most birds build nests.
5. Some animals can survive in cold weather.
6. Many animals escape their enemies.
7. Some animals need human protection.
8. Some living things tend to avoid extremes of temperature, moisture, light and sound.
9. Animals prepare for winter in different ways.
10. Birds have various means of locomotion.
11. Most animals are able to move about freely.

B. Animals have young

1. All living things change as they grow.
2. People grow up and have children.
3. All animals "grow up" (mature) and have young.
4. Some animals give care to young.
5. In animals the resemblance between parents and young increases as the young grow older.
6. Most animals are hatched from eggs or are born.
7. Many animals are born in the spring.
8. Most birds build nests in which they lay eggs and rear young.
9. A caterpillar develops into a butterfly or a moth.
10. Caterpillars usually spin cocoons around themselves.
11. Butterflies and moths emerge from cocoons.

C. How plants live and grow

1. Plants live in many different environments.
2. Most economically important plants grow in soil.
3. Most of our food is grown on soil.
4. Most plants need soil and warmth to grow.
5. Most plants need air and water for growth.
6. Plants require soil, light, air and water.
7. Plants grow better in some soils than in others.
8. Too much water may kill a plant.
9. Most green plants make and store their own food.
10. Green plants need light energy to make their own food.
11. Chlorophyll in green plants enables them to make their own food.
12. Food is stored in various parts of the plant.
13. Some plants may be grown from parts of other plants.
14. Some plants grow from bulbs.
15. Plants usually produce many more seeds than can germinate and survive.
16. All plants have a life cycle.

D. Understanding ourselves

1. Much of man's food and clothing comes from domesticated plants.

2. Yeast plants are useful to man.

3. People use both plants and animals for food.

4. Not all parts of food plants are used for food.

5. Different structures of the different kinds of food plants are used for food.

6. Food which is thoroughly chewed can be digested more readily.

7. The minerals and vitamins necessary for strong, healthy teeth are supplied by proper diet.

8. Some plants are prickly or have stinging hairs which cause skin irritations.

9. Some plants are poisonous to the skin of some people.

III. Energy

A. How sounds travel

1. Sound is caused by the vibration of an object.
2. Sound travels out in all directions from a source of vibration.
3. Sounds travel through many substances.
4. Sound goes through some things better than through others.
5. Most sounds travel through the air to our ears.
6. The ear does not receive sound instantaneously.
7. Sound requires time to travel.
8. Sounds may be directed.
9. Sounds may be reflected.
10. An echo is a reflected sound.
11. Some sounds are noise and some are music.

B. Light and how it is reflected

1. Light travels in straight lines.
2. Objects can be seen distinctly through transparent materials.
3. Sunlight and other kinds of light can be reflected.
4. Most objects reflect some light.
5. Some objects are better reflectors than others.
6. Light from smooth, polished surfaces may be injurious to the eye.
7. All things which are far away seem small; the closer they are, the larger they appear to be.

C. Magnets and what they do

1. Magnets help us in our daily work.
2. Some magnets are used in our homes.
3. Magnets may have several shapes.
4. Some magnets are stronger than others.
5. A magnet is stronger near its ends.
6. Magnets pick up and pull objects made of iron and steel.
7. The pulling power of a magnet will act through many different materials.

D. Things that help and hinder work

1. An inclined plane is a sloping surface.
2. The inclined plane makes tasks easier.
3. A weight can be pushed or pulled up an inclined plane more easily than it can be lifted straight up.
4. A lever may be used to lift or push.
5. Friction is used to start some stationary objects or to stop some moving objects.
6. If a surface is rough, friction is greater; if a surface is smooth, the friction is less.
7. Friction always produces two effects; heat and wear.

IV. The Universe

A. What we see in the sky

1. Sometimes the moon may be seen in the sky during the day.
2. The moon is smaller than the earth.
3. The moon revolves around the earth.
4. The moon "shines" only by reflected light from the sun.
5. The moon reflects the sun's light.
6. As far as is known there is no life on the moon.
7. No water or air are on the moon.
8. The moon, although very far away, is closer than the sun and the stars.
9. It is difficult to go to the moon.
10. The sun is larger than the earth.
11. The sun is farther away than clouds.
12. The sun is always shining somewhere.
13. The sun is in the sky every day although it is sometimes hidden by clouds.
14. The sun shines on the other side of the earth during the night.
15. The sun sets at different times each day.
16. Stars are all around us in the sky.
17. Stars appear to be small, bright objects visible in the night sky.
18. Some stars appear to be brighter and larger than others.
19. The stars are farther away than the clouds.
20. Groups of stars have names.

B. Movements of the earth

1. The earth spins somewhat like a top but has no visible support.

2. It takes the time of one day and one night for the earth to turn around once (rotation).

3. The earth moves around the sun.

4. As the earth turns around, the place where we live moves around from the side toward the sun (day) to the side away from the sun (night) and back to the side toward the sun (day).

5. One year contains one of each season.

6. Summer follows spring and comes before fall; winter follows fall and comes before spring.

7. The rotation of the earth causes the apparent motion of the sun, moon and stars.

8. The earth pulls everything towards it.

A RESOURCE UNIT

III. ENERGY -

D. THINGS THAT HELP AND HINDER WORK

TO BE TAUGHT IN

GRADE TWO

To be included in the Grade Two Supplement of the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department
9-4-1962

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INTRODUCTION

The learning experiences included in this resource unit are suggestions which could be used to teach the understandings (concepts) in this unit. Some of the experiences might be done by students, while others are appropriate for a teacher to use as demonstration activities. The classroom teacher who is familiar with the facilities of the school and the needs of her students can best judge how to make use of these suggestions or how she can modify them to meet the pupils' needs. The wording of the "What to do" part of some of the experiences has been written in terms of the directions which a teacher might follow or in terms of the directions and diagrams which the teacher would interpret to the students. Although the wording has been simplified, a student should not be expected to read these directions and follow them on his own initiative. The classroom teacher is to determine whether an experience is to be carried out by an individual, a small group, or the entire class.

In the preparation of this resource unit each section has been designed to be of the maximum assistance to the classroom teacher. In addition to the suggestions for learning experiences, a section on evaluation has been developed for teacher use only. Each book and sensory aid has been annotated in the bibliography. A complete listing of all of the materials needed for teaching this unit has been included also.

This resource unit is not intended to restrict a teacher's instructional procedures. Teachers should teach in whatever ways are most effective with their pupils. Although all concepts should be taught, time may not permit the use of all of the experiences suggested under any one concept. In general, the skilled teacher will sort the experiences, reject those which are not appropriate to his or her class facilities or time available, and use only the experiences which produce the most effective instruction.

At the conclusion of the teaching of this unit, the teacher should make a careful review of the learnings to be sure the children have an understanding of each concept.

Since the unit is intended for grade two pupils, the unit does not contain experiences which are thought to be too abstract for their understanding. Examples of the kind of experiences which are not included in the unit are the identification of the classes of levers; kinds of friction; other simple machines--wheels and axles, pulleys, screws, wedges; effort and resistance distances; ways of decreasing friction; use of technical terminology; and quantitative evaluation in most learning experiences.

I. CONCEPTS INCLUDED IN THIS UNIT

Things that help and hinder work

1. An inclined plane is a sloping surface.
2. The inclined plane makes tasks easier.
3. A weight can be pushed or pulled up an inclined plane more easily than it can be lifted straight up.
4. A lever may be used to lift or push.
5. Friction is used to start some stationary objects or to stop some moving objects.
6. If a surface is rough, friction is greater; if a surface is smooth, the friction is less.
7. Friction always produces two effects: heat and wear.

II. LEARNING EXPERIENCES

CONCEPT #1: An inclined plane is a sloping surface.

The purpose of these experiences is to alert the pupils to the existence of inclined planes and to provide them with enough identifying experiences so that they can recognize inclined planes as they see them. The experiences which could be used to initiate this study would depend on the time of the year. Sledding on snow and the Shrine Circus in February provide excellent topics which could lead into a winter study of inclined planes. Sporting events in Metropolitan Stadium and the University Stadium, parking ramps, the Minneapolis-St. Paul International Air Terminal, and playground slides may lead into the study of this unit during the spring or fall.

A. Introductory

Experience 1: To discover that there are different kinds of surfaces

Materials needed:

Blindfolds

What to do:

Blindfold one member of the class at a time. Have him walk over level and hilly surfaces. Have him explain how he can tell you when he is walking on the level; up hill or down a hill.

Discovering that:

A level surface is different from a slanted surface.

Experience 2: To introduce the idea that slanted surfaces are inclined planes

Discuss the questions:

1) How do we move from one place to another?

2) Do we always move over level ground? Give some examples.

3) What are some of the names which we use for surfaces which are not level?

Experience 3: To identify the inclined planes which are used in some kinds of play

a. Read stories about snow fun. Recognize that sliding on snow would not be as much fun without hills (inclined planes). Tell about your own experiences in the snow. Discuss the questions:

 1) Is it fun to slide over level ground? Give some examples.

 2) Why is it more fun to slide down a hill on a sled?

 3) Why is it fun to ski?

 4) Have you ever seen a ski jumper in action? What kind of an inclined plane does a ski jumper use?

b. Draw pictures about inclined planes used in play, including snow fun. (Call attention to slides, and sliding and skiing on snowy hills.)

c. Make a scrapbook or bulletin board illustrating the importance of inclined planes to some kinds of snow fun.

d. Make a list of the inclined planes used in play; e.g., a playground slide.

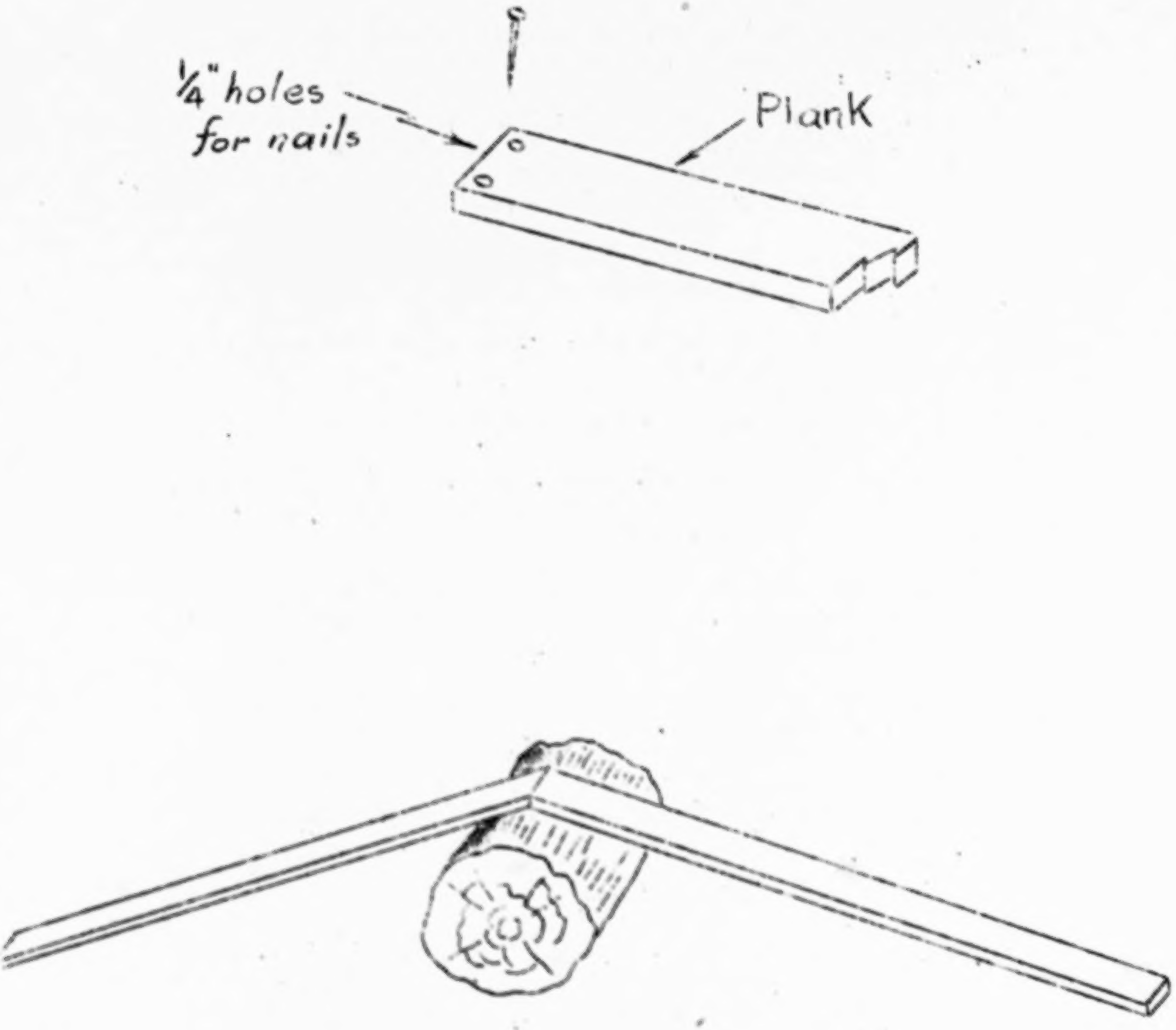

¼" holes
for nails
Plank

Diagram for Experience 1 - Page 7

B. Developmental

Experience 1: To show that inclined planes are sloping surfaces

Materials needed:

Planks, 2" x 10" x 8' long (2)
Log, short chunk, 12" diameter minimum
Hammer
Nails, 8 pennyweight (4)
Film, "Simple Machines: The Inclined Plane Family"

Optional preparation of material: Drill a pair of holes, ½" in diameter, 5" apart, centered on the plank's width, 1½" from one end of both planks.

What to do:

View the film, "Simple Machines: The Inclined Plane Family".

Construct a double inclined plane in the classroom which is safe and strong enough to have children walk on it many times. Lay the ends of the plank on the log so that they may be nailed easily with the 8 pennyweight nails through the holes which have been drilled. Nail the planks firmly to the log. See diagram.

Use the inclined plane (ramp) e.g., recreational reading location, a stage for singing a solo, "gateway to pretend time", modification of musical chairs games.

*Answer these questions in arithmetic:

1) How long and wide are the planks?

2) How long and how high is your inclined plane?

3) How much time did it take to make your inclined plane?

4) How much did your supplies cost?

Discovering that:

Inclined planes are sloping surfaces. The road over a hill is two or more inclined planes which adjoin one another. Inclined planes can be used in play.

*Note: See Guide to Teaching Arithmetic, pp. 82, 85, 86.

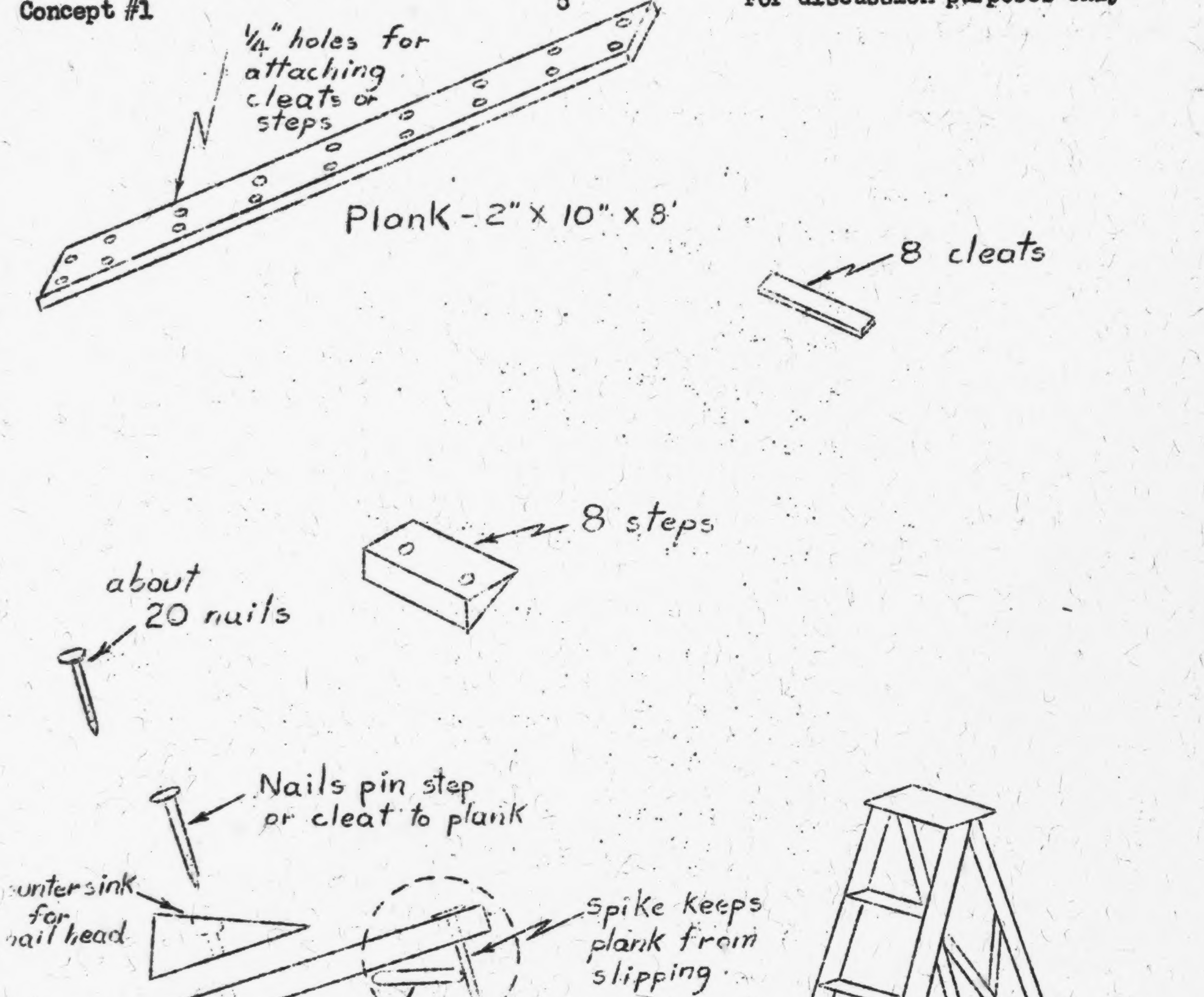

1/4" holes for attaching cleats or steps
Plank - 2" x 10" x 8'
8 cleats
8 steps
about 20 nails
Nails pin step or cleat to plank
ountersink for ail head
Spike keeps plank from slipping
Detail
Ladder step
Brace ladder against wall

Diagram for Experience 2 - Pages 9 and 10

Experience 2: To discover that stairs are notched inclined planes

Note: The preparation and cost of materials for this experience may limit its usefulness. Since lumber yards are not equipped to easily make the materials, helpful and willing parents are required. The use of drawings on the blackboard would be a much less satisfactory way of obtaining some of the same learnings.

Materials needed:

Plank, 2" x 10" x 8' long
Cleats, wood, $\frac{1}{2}$" x 2" x 9" long (8)
Nails, 30 pennyweight (about 20)
Stepladder, about 5'
Wood, triangular blocks, 9" long, cut from a 3' length
of 4" x 6" stock (8)

Preparation of materials: Cut a 3' length of 4" x 6" lumber on the diagonal of the end cross section. Cut the triangular lengths into 9" blocks.

Cut eight 9" cleats from $\frac{1}{2}$" x 2" x 6' long stock.

Drill a pair of holes 5" apart, centered on the plank's width, 1$\frac{1}{2}$" from each end of the plank. Make the diameter of the holes in the plank only slightly larger than the diameter of the shank of the 30 pennyweight spikes by using a $\frac{1}{4}$" drill. Drill seven more pairs of holes, spaced along the length of the plank about 1' apart. See diagram.

Drill matching pairs of holes with the same diameter in each triangular wood block -- 5" apart, centered on the length of the block. Drill the holes perpendicular to the hypotenuse side of the block. See diagram. Drill matching pairs of holes with the same diameter in each cleat, the same as above -- 5" apart, centered on the length of the cleat.

Recess the spike heads by drilling a larger hole 1/8" deep in each triangular wood block and in each cleat. Center these larger depressions over the first holes to allow the top of the spike to be inserted flush to the wood block. Make the larger depressions over the holes in the triangular blocks on the side away from the hypotenuse of the triangle. Make the diameter of these larger depressions only slightly larger than the diameter of the head of the 30 pennyweight spikes by using a $\frac{1}{2}$" drill.

Coat each piece of wood with floor seal; this coating makes it easier to keep the wood clean.

What to do:

Set up the stepladder so that the bottom of each back leg is braced against the wall. Lean the plank on the bottom step of the stepladder. Insert two spikes through the uppermost pair of holes in the plank. Move the plank so that the spikes hang down behind the steps. See diagram. Have several pupils steady the plank and the ladder so that neither slips. Have one child stand on each side of the plank to steady the child walking the inclined plane if he begins to fall off the plank.

Walk up the plank. Stand upright as you walk up the inclined plane. (Do not hang onto the plank as you walk it.) Continue to repeat the experiment, leaning the plank against the next higher step until it is not possible to walk up the plank with leather soled shoes.

Attach the 8 wood cleats across the width of the plank by inserting a pair of spikes through each cleat and the plank. Repeat the experiment in full; discover whether the cleats increase the ease of walking up the inclined plane.

Lift off the wood cleats and attach the 8 triangular wood blocks by inserting a pair of spikes through each wood block and the plank. (Be sure the sharpest angle on the triangular wood block is towards the upper end of the plank and each block is resting on its hypotenuse.) Walk up the notched inclined plane (stairs) which is leaning against the highest step used previously in this experience.

Observe the surface of the plank. Compare the 8' plank with triangular cross pieces to stairs.

Compare the ease of walking an inclined plane which is smooth with a notched inclined plane.

Discovering that:

Inclined planes may be hard to walk up because shoes may slip on the surface. Stairs, which are really inclined planes with notches, prevent slipping.

Note: If your gym is not heavily scheduled for physical education classes and has either stall bars or a horizontal ladder, greater safety may be achieved by using the stall bars or horizontal ladder as a substitute for the stepladder.

C. Culminating

Experience 1: To review that inclined planes may be found almost everywhere and are very numerous

a. List all the inclined planes you can find at different places; e.g., at home, in the school, on your way to school.

b. Make drawings to illustrate common inclined planes which you have seen.

c. Make a clipping scrapbook in which as many different inclined planes as possible are shown. Try to show how many inclined planes are around us.

Experience 2: To emphasize that inclined planes may be very different in appearance

Make a scrapbook with art work illustrating different kinds of inclined planes, giving them their more commonly used names. Emphasize the different names for commonly used inclined planes.

Experience 3: To review the relation of stairs to other inclined planes

Draw a number of floors of a department store on the blackboard. Draw in the stairways and stairs. Draw in the inclined plane (with a smooth surface) which is formed by the stairways. Discover that stairs are conveniently notched inclined planes.

Experience 4: To explore the idea that a smooth inclined plane may be more convenient than a notched inclined plane (stairs)

Discuss the following questions:

1) What are some things which you cannot lift?
2) Where have you seen a ramp used to raise a heavy object?
3) When have you used a ramp to raise something heavy?
4) Can you lift your bike easily up the steps into your house? Explain.

Experience 5: To show that when many inclined planes are joined together, it may be possible to climb a steep hill

Discuss the questions:

1) Are some hills so steep that cars and trains cannot climb directly to the top?
2) How do cars go up a steep hill?
3) How do we construct roads up some mountains?
4) Does a road up a mountain consist of many inclined planes?
5) How do trains climb to the tops of mountains?

CONCEPT #2: An inclined plane makes tasks easier.

The purpose of these experiences is to help the children understand the advantages of using inclined planes. The previous experiences allowed them to become familiar with inclined planes and to learn how to identify them. The experiences in this section are intended to show that they have a definite use in the movement of heavy or awkward objects up to a higher level or down to a lower level. The word "easier" in the above concept is interpreted as requiring less effort. However, an inclined plane does not decrease the total work done in lifting an object.

A. Introductory

Experience 1: To review a common use of inclined planes

Discuss the questions:

1) How do we go from one floor of the school to another?

2) Which methods of getting from one floor of a department store to another depend on an inclined plane?

3) Where else are inclined planes used to go from one level to another?

Experience 2: To show some uses of inclined planes

Make a bulletin board of drawings of inclined planes. Use titles such as "Making Use of Inclined Planes" or "Fun in the Snow with Inclined Planes".

B. Developmental

Experience 1: To see inclined planes which are used in business

Materials needed:

Bus fare

What to do:

Go on a study trip to a business which makes use of loading ramps or conveyor belts from one floor to another; e.g., Post Office, large grocery store, potato chip factory.

Note: This study trip may be correlated with a social studies unit.

Discovering that:

Businesses use inclined planes to do work more rapidly and to decrease the effort needed.

Experience 2: To illustrate a use of an inclined plane

Materials needed:

Film, "Circus Day"
Toy circus animals
Cardboard, stiff (size to fit door of cattle car on toy train)
Toy train
Toy animal cages (made from shoe boxes)

What to do:

View the first four minutes of the film, "Circus Day".

Borrow toy circus animals from the children's homes or from the kindergarten teacher. Assemble the materials to make a miniature circus with animals, the circus train, and loading ramp (stiff cardboard).

Pretend to load the animals on the train, travel to the city, and unload these animals from the train at the city. Transfer the lions and tigers into their cages from the circus ring.

Discovering that:

Ramps (inclined planes) are used to load and unload animals from trains. Inclined planes are used in circuses.

Experience 3: To show that an inclined plane can be used to move bulky, awkward materials

Materials needed:

Carton, cardboard, large (box from refrigerator, television or mattress)
Planks, 2" x 10" x 8' long (2)
Table, about 30" high

What to do:

Obtain a box which is so large that you have difficulty in getting a hold on it. Try to lift the box onto a table.

Lean the two planks, side by side, against the table. Push the box up the inclined plane.

Compare the results of each trial.

Discovering that:

Bulky, awkward materials may be moved easily up a wide ramp.

C. Culminating

Experience 1: To review the idea that inclined planes are used to climb to higher levels

Discuss the questions:

1) How did you get to your seat at the circus in the Municipal Auditorium or at the baseball game in Metropolitan Stadium?

2) Have you ridden in an automobile when it is being parked in a parking ramp? Tell us about it.

Experience 2: To review the uses of inclined planes

a. Make a list of examples you have seen where an inclined plane has been used to make a job easier; e.g., moving a refrigerator into a house, moving voting machines into school, moving furniture into a house.

b. Make up a story which includes the use of any inclined plane.

c. Talk to your grocer, druggist, baker and hardware merchant to see if you can find ways in which inclined planes are used in business.

Experience 3: To review uses of inclined planes by using toys as examples

Prepare an "inclined plane corner" in the classroom, using toys to show inclined planes; e.g., gangplank for toy ship, passenger ramp for toy airplane, tail gate of toy moving van, ramp for loading animals into a toy train.

CONCEPT #3: A weight can be pushed or pulled up an inclined plane more easily than it can be lifted straight up.

The purpose of the experiences listed for this concept is to help the children to understand that the amount of effort required to lift an object can be decreased when a ramp is used to raise the object rather than to lift it vertically to the desired height. The relation of the steepness of an inclined plane to the ease of its use is another idea which can be developed with the children.

A. Introductory

Experience 1: To introduce the idea that inclined planes are used to decrease effort required

Materials needed:

Film, "Simple Machines: The Inclined Plane Family"

What to do:

View the film, "Simple Machines: The Inclined Plane Family". Discuss the film, emphasizing the use of the inclined plane as a labor-saving device.

Discovering that:

An inclined plane can be used to decrease the amount of effort required to do a job.

Experience 2: To introduce the idea that walking on a ramp only decreases the effort

Discuss the questions:

1) Why do you lean forward as you go up a ramp and lean backward as you come down? (If you do not remember, try walking rapidly on a ramp.)

2) Why do you breathe more rapidly immediately after you have walked up a ramp?

B. Developmental

Experience 1: To use an inclined plane to move heavy objects

Materials needed:

Carton, cardboard (strong)
Plank, 2" x 10" x 8' long
Table, about 30" high
Books

What to do:

Collect a large quantity of books and place the books in a carton. Try to lift the carton of books up to the table.

Lean one end of the smooth plank against the table and have a friend brace the other end. Place the carton of books on the lower end of the plank. Push or pull the carton up the plank onto the table.

Compare the amounts of effort used to the results obtained in both cases.

Discovering that:

It requires less effort to push or pull the carton of books up a ramp than to lift it.

Experience 2: To show that changing the shape of an inclined plane affects the ease of movement over the surface

Materials needed:

Board, 1" x 4" x 6' long
Books
Toy truck or wagon*
Blocks of wood*, ½" x ½" x 1" long maximum (4)

What to do:

Pile the books one on top of the other. Put one end of the board on the books and the other end on the floor to represent a hill.

Place a toy wagon or truck part way up on the board. Let go and observe what happens.

Replace the truck on the board. Place a small block of wood against the lower side of each wheel. Let go and observe what happens.

Compare the results.

Discovering that:

Adding the blocks to the inclined plane changes the contour of the inclined plane. A change in contour affects the ease of movement down the inclined plane.

*Note: If you have one inch or smaller diameter wheels on the toy truck or wagon, blocks as small as square matches or toothpicks may be used. For wheels six inches in diameter or larger, ½" x ½" blocks may be found satisfactory.

Experience 3: To measure the difference in the amount of effort used as an object is lifted vertically and is moved up an inclined plane

Materials needed:

Plank, 2" x 10" x 8' long
Books
Scale, spring balance
Cord, heavy
Board, 2" x 4" x 4" long
Tack, thumb

What to do:

Make a ramp by leaning the long plank on the top book of a 4" pile of books.

Push a tack into the end of the 2" x 4" board. Tie the cord to the thumb tack in the piece of 2" x 4" board.

Use a spring balance scale to measure how much effort (weight) is required to lift the board.

Place the board on the ramp and measure the amount of effort needed to raise the board by pulling it up the ramp.

Compare the amount of effort required for each trial.

Discovering that:

Less effort is needed to raise a weight if it is pulled up a ramp rather than lifted vertically.

Experience 4: To discover that a change in steepness of a ramp changes the effort required to move an object up the ramp

Materials needed:

Plank, 2" x 10" x 8' long
Books
Scale, spring balance
Cord, heavy
Board, 2" x 4" x 4" long

What to do:

Repeat the activity which measures effort needed to pull an object up a ramp (see Experience 3, page 23), varying the steepness of the inclined plane.

Compare the effort required as the steepness is increased.

Discovering that:

The steeper the inclined plane, the more effort which is needed to push or pull an object up the inclined plane. The steeper the ramp, the closer the effort required approaches the amount of effort required to lift the books vertically.

C. Culminating

Experience 1: To review the idea that greater amounts of effort are required when steeper inclined planes are used

Discuss the questions:

1) Is it easier to climb a vertical ladder or to climb the ladder when it is at a slant?

2) Why is it easier to climb a ramp than to climb steps to the same height?

3) Are steps usually used on an inclined plane which is steeper than a ramp?

4) Do steps have to be steeper than a ramp?

Experience 2: To discover where inclined planes might be used in our school to make work easier

Tour the building to find examples of where heavy work might be made easier by the use of inclined planes.

CONCEPT #4: A lever may be used to lift or push.

The purpose of these experiences is to enable the children to learn that levers may be used to move heavy things with little effort expended or to move things faster with greater effort. Other ideas which may be developed are: that levers may be used which move from side to side as well as up and down; that the longer a lever is, the heavier the object to be moved may be; that every lever has a point that does not move (fulcrum); and that a child may move an object heavier than himself through the use of a lever.

A. Introductory

Experience 1: To identify a lever

Materials needed:

Teeter totter

What to do:

Observe a teeter totter. Note that a teeter totter is used by children to lift each other alternately.

Look for the part of the teeter totter that moves the least. Note that both ends move a great deal.

Have a child sit on one end of the teeter totter and have some of the children lift him by pulling and/or pushing down on the opposite end of the plank.

Discovering that:

A teeter totter moves children up and down. One part of the teeter totter moves very little. Both ends of the teeter totter move at the same time. A teeter totter may be used to lift things.

Experience 2: To discover the parts of a teeter totter

Materials needed:

Log, short chunk, 12" diameter minimum
Plank, 2" x 10" x 8' long
Book

What to do:

Place the log on its side on the floor. Place the plank across the log in a teeter totter fashion.

Push down (effort) on the raised end. Observe what happens. Release the effort gradually.

Place a book (resistance) on the lower end of the plank. Push down (effort) on the raised end of the plank again. Release the effort gradually.

Observe that one part of the teeter totter (lever) does not move to any extent, and that the place where you push and the place where the book rests do move a great deal.

Discovering that:

A lever consists of a rigid rod, plank or tool which moves very little at the point of support (fulcrum). An effort is usually able to overcome the resistance. Both effort and resistance move at the same time.

Experience 3: To study the kinds of fulcrums

Materials needed:

Log, short chunk, 12" diameter minimum
Plank, 2" x 10" x 8' long
Wood block, triangular, for fulcrum
Chair, student
Books

What to do:

Place the log on its side on the floor. Balance the plank across the log in a teeter totter fashion.

Experiment to see the effect of different numbers of children sitting on either end of the plank. Note whether the plank with the different number of children is always balanced.

Place the triangular block of wood on the chair. Balance only the plank across the triangular block of wood in a teeter totter fashion.

Experiment to see the effect of different weights of books on either end of the plank. Note the difficulty of producing balance with the triangular block as a fulcrum.

Compare the difficulty of producing balance with the two different fulcrums.

Discovering that:

A fulcrum does not have a special shape.

Note: The second part of the above activity may be done using an inverted wastepaper basket to support the triangular block of wood, unless the bottom of the basket is recessed.

B. Developmental

Experience 1: To illustrate the use of a lever to lift a heavy object

Materials needed:

Wood block, triangular, for fulcrum
Board, 1" x 4" x 6' long
Books
Carton, cardboard (strong)

What to do:

Place the books in the carton. Balance the heavy carton on one end of the board. Raise the other end of the board as high as you can without spilling the carton off the board. Push the triangular block of wood under the board until it is as close as possible to the end on which the books are resting.

Raise the carton of books by applying force on the long end of the board.

Discovering that:

Heavy weights may be lifted if a lever is used.

B. Developmental

Experience 1: To illustrate the use of a lever to lift a heavy object

Materials needed:

Wood block, triangular, for fulcrum
Board, 1" x 4" x 6' long
Books
Carton, cardboard (strong)

What to do:

Place the books in the carton. Balance the heavy carton on one end of the board. Raise the other end of the board as high as you can without spilling the carton off the board. Push the triangular block of wood under the board until it is as close as possible to the end on which the books are resting.

Raise the carton of books by applying force on the long end of the board.

Discovering that:

Heavy weights may be lifted if a lever is used.

Experience 2: To discover that levers can be used to make lifting easier

Materials needed:

Wheelbarrow, toy
Books, heavy stack

What to do:

Lift the books in your hands.

Place the books in the wheelbarrow. Lift the books again.

Compare the amount of effort you used to raise the books in both instances. Note that it is easier to lift the books in a wheelbarrow.

Discovering that:

The wheelbarrow is a kind of lever.

Experience 3: To show how a lighter weight may raise a heavier weight if a lever is used correctly

Materials needed:

Board, 1" x 4" x 29" long
Wood block, triangular, for fulcrum
Brick
Stone which weighs less than the brick

What to do:

Put a brick on the end of the board. Lift the other end of the board and push the triangular block of wood (fulcrum, or point of pivot) under the board.

Put the stone on the raised end of the board. Observe whether the lower end goes up.

Move the triangular block of wood to a new position as close to the brick as possible without dumping the brick off the board. Repeat the experiment.

Observe that if the triangular block of wood is moved far enough towards the end on which the brick rests, the stone raises the brick.

Discovering that:

A lighter weight may lift a heavier weight when a lever is used.

Note: If too long a lever is used, the weight of the lever, which appears to act at its center, exerts enough downward force to lift the resistance.

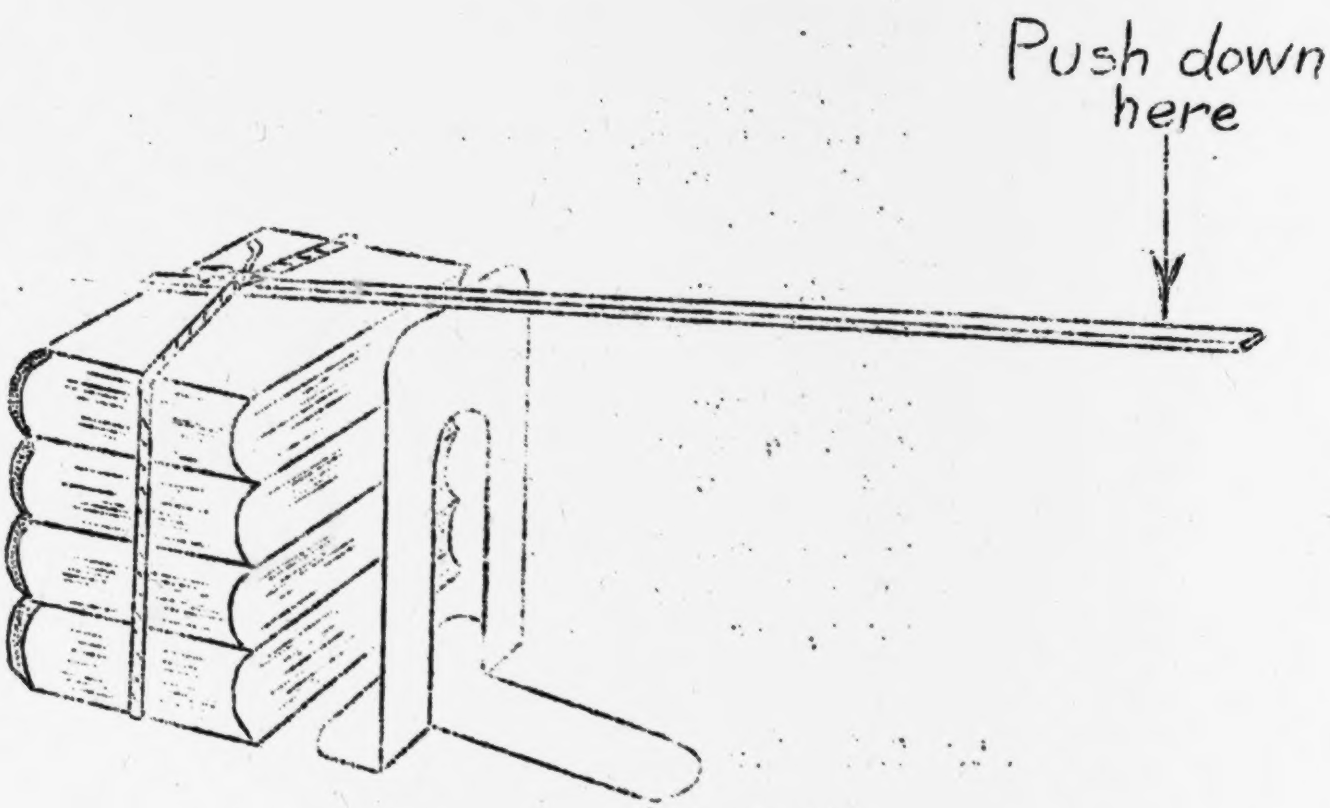

Push down here

Diagram for Experience 4 - Page 35

Experience 4: To illustrate that the same amount of effort can accomplish more if a lever is used

Materials needed:

Books
Cord, heavy
Book end
Ruler, rigid, or board, 1" x 4" x 29" (also used in Experiences 3, 5 and 6, Concept #4)

What to do:

Tie the books together with the cord. Try to lift the books with one finger.

Place the book end next to the books. Insert the ruler (or board) under the cord on the books.

Push the book end under the ruler. Adjust the location of the book end so the end of the ruler under the cord is very close to the book end. See diagram. Raise the books by pushing with one finger.

Decide which method makes the books easier to raise.

Discovering that:

Sometimes the same effort can lift more weight if a machine is used.

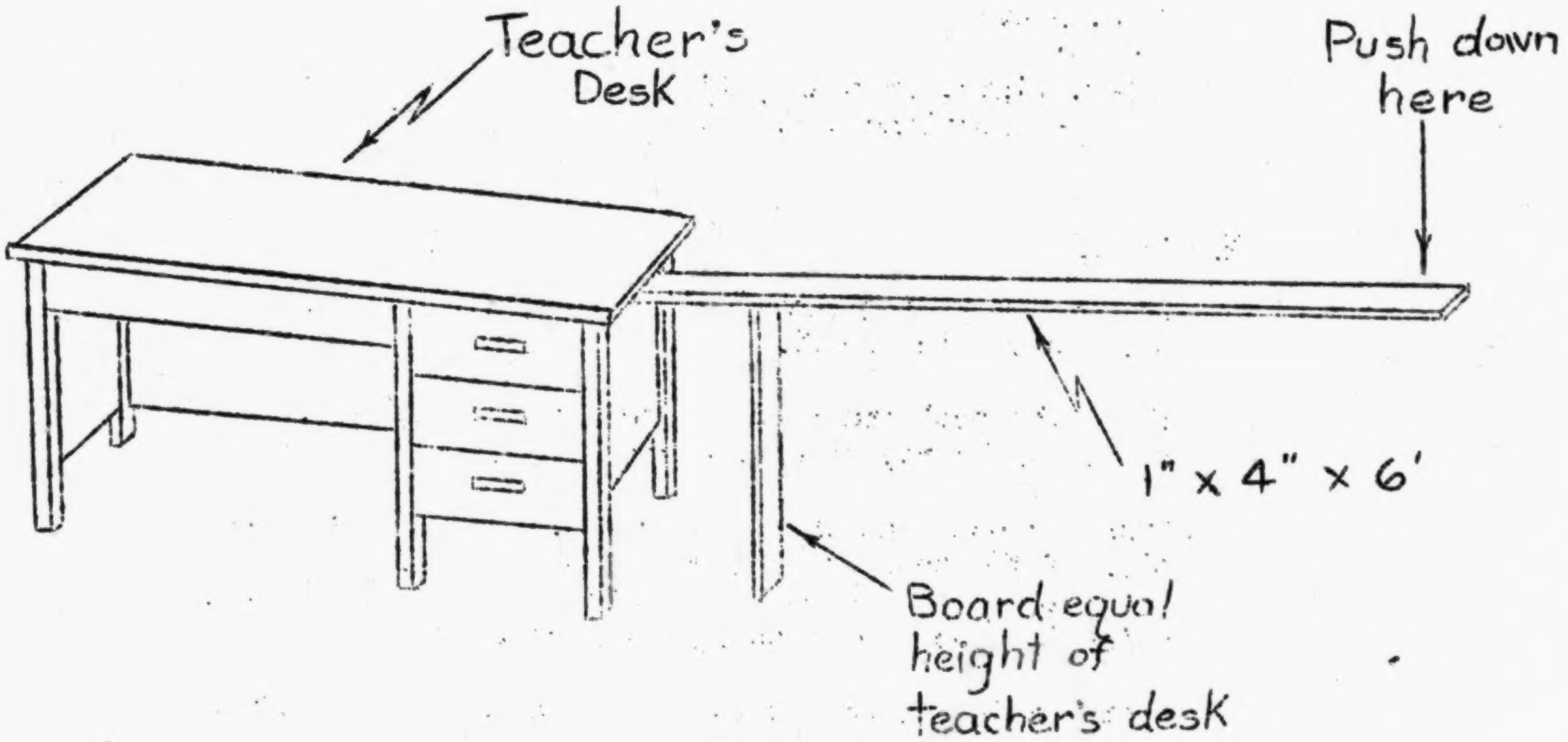

Teacher's Desk
Push down here
1" x 4" x 6'
Board equal height of teacher's desk

Diagram for Experience 5 - Page 37

Experience 5: To show that tall objects can be lifted with a lever

Materials needed:

Desk, teacher
Board, the height of the teacher's desk,
approximately 1" x 4" x 29" long
Board, 1" x 4" x 6' long

What to do:

Place the board which is the height of the teacher's desk on end near the teacher's desk. Hold the board in position.

Place the other board across the end of the vertical board so that the shorter end rests under the edge (overhang) of the desk. See diagram.

Move the longer end of the board down to raise the desk.

Discovering that:

Tall objects may be raised when the fulcrum is tall enough. The height of fulcrums may differ.

Experience 6: To measure the effect of moving the fulcrum along the lever between the effort and resistance

Materials needed:

Pencils (2)
Rulers, rigid, (2) - one at least 18" long, or
Board, 1" x 4" x 29" long (also used in Experiences 3, 4 and 5, Concept #4)
Tape, masking
Rubber band, large
Book

What to do:

Tape the shorter ruler to the edge of a table in a vertical position with the zero reading toward the table top.

Place the other ruler on the table with one end extending beyond the edge of the table.

Hang a rubber band over the extended edge of the ruler at about the 1 inch mark. Please the book on the other end of the ruler which is on the table.

Place a pencil under the middle of the ruler. Insert the second pencil through the loop in the rubber band. Keep the pencil parallel to the floor and pull down on the rubber band until the book just begins to rise. Observe that the pencil points toward the vertical ruler. Read the length of the rubber band on the ruler.

Move the pencil (fulcrum) under the lever closer to the book and measure the length to which the rubber band must stretch before raising the book.

Move the pencil (fulcrum) to other positions and measure the stretch of the rubber band at each position.

Answer the question: Do you place the pencil (fulcrum) nearer or farther from the book (resistance) in order to raise the book with more stretching of the rubber band (effort)?

Discovering that:

The closer the fulcrum is to the object to be moved, the less effort that is needed to move the object.

Experience 7: To show that when a lever is used, less effort is needed to lift a nail out of wood

Materials needed:

Hammer
Board, 2" x 4" x 2' long
Nail, 6 pennyweight

What to do:

Pound the nail part way into the board. Try to pull the nail from the board with your hands.

Use the hammer to pull the nail from the wood. (A cloth or jacket may be put over the nail being pulled to prevent it from flying from the claws of the hammer.)

Discovering that:

The hammer is a bent lever. Use of a lever may make a job easy since less effort is required.

Experience 8: To illustrate the effect of moving the resistance in relation to the fulcrum

Materials needed:

Scissors
Cardboard, thin
Tin snips
Metal, sheet

What to do:

Try to cut the cardboard using only the cutting edge near the points of the scissors.

Move the cardboard closer to the screw or pivot with which the two blades are fastened together. Try to cut the cardboard again. Compare the effort needed to cut the cardboard in both instances.

Repeat the experiment, using tin snips and sheet metal. (The use of gloves when handling sheet metal may prevent severe cuts.)

Discovering that:

The closer you place a material to the fulcrum, the easier it is to cut the material.

Experience 9: To illustrate the use of a lever in applying force on an object

Materials needed:

Nutcracker
Nuts, hard-shelled

What to do:

Experiment cracking nuts at different distances from the closed end of the nutcracker.

Compare the distance to the amount of effort required.

Discovering that:

The nut is easiest to crack near the fulcrum.

Experience 10: To discover the different possible arrangements of the effort, resistance and fulcrum

Materials needed:

Board, 1" x 4" x 6' long
Wood block, triangular, for fulcrum

What to do:

Arrange the board and the triangular block into as many different arrangements as possible by moving the block along under the board.

Identify the position of fulcrum, force and load each time.

Discovering that:

Each part of a lever has a name. There are different ways in which the parts of a lever can be arranged.

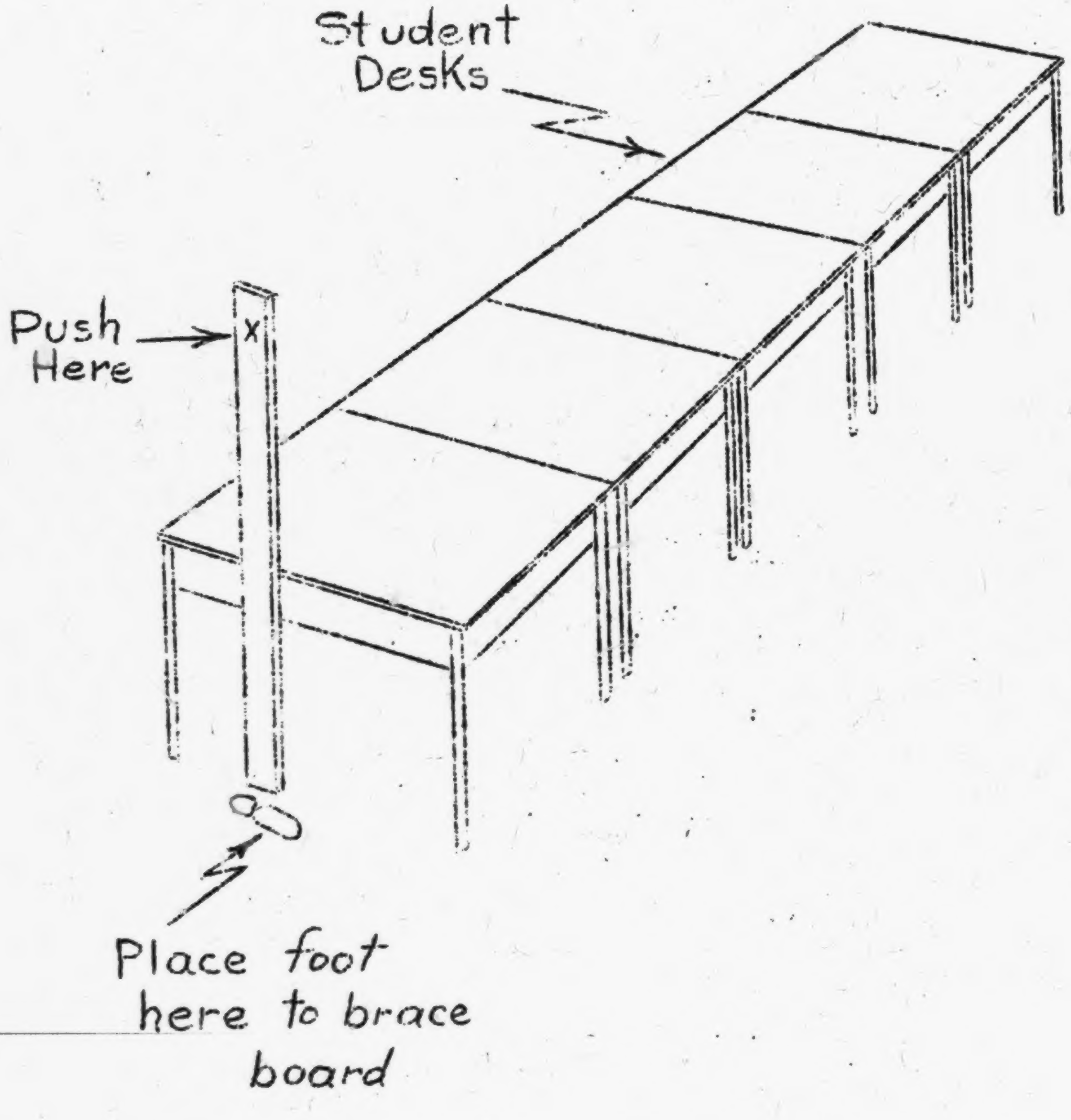

Student Desks
Push Here
x
Place foot here to brace board

Diagram for Experience 11 - Page 43

Experience 11: To discover that a lever can be used to push heavy objects

Materials needed:

Board, 1" x 4" x 6' long
Desks, student (5)

What to do:

Place five student desks in a row with their edges touching one another. Try to push the desks across the floor.

Hold the board vertical (perpendicular to the floor) with the lower end on the floor directly below the edge of the desk at the end of the row. Brace the end of the board which is resting on the floor with your foot so that it cannot move toward you.

Reach up on the board as high as is comfortable. Push on the board. See diagram. Observe whether the desks move.

Discovering that:

Heavy loads may be pushed if a lever is used.

C. Culminating

Experience 1: To emphasize the use of levers in doing work

a. Find pictures in magazines which show levers. Make a picture chart which shows different jobs which are made easier because levers are used.

b. Make a bulletin board. Form the different kinds of levers out of construction paper. Display these to show how levers are used in doing work.

c. Interview some adults (engineer, clerk, parents) to find out how they use levers.

Experience 2: To start the understanding of the uses of levers

Discuss and suggest possible solutions for these problems:

1) A caveman wishes to roll a huge stone into the cave entrance to protect himself from wild animals. What should he do to make moving the stone easier?

2) Tom and Dick are helping their father move some dirt from a pile in the front of the yard to the back yard. What two different levers would they use to lift the dirt?

3) If you want to open a can of paint, or a can of cocoa, how can you raise one side of the lid?

4) John wants to teeter totter with his brother, Bill, who is much lighter. Should John sit nearer the fulcrum of the teeter totter?

5) Judy wants to open a bottle of grape juice. What lever would make it easy for her to open the bottle?

Experience 3 - To identify some of the tools from home which are levers and to review the parts of levers

a. Arrange a display table. Bring to class any objects that you can find at home which you think are levers. (Hammers, scissors, can openers, spoons, brooms, baseball bats, balances, pumps, crowbars may be used.)

Entitle the display "What Do All Levers Have in Common?". Have your display point out that all levers have a part that does not move, called the "fulcrum" and that to move or lift a load, an effort (applied force or pressure) is always necessary.

b. Make a list of levers which make work easier:

1) Things which help father; e.g., hammer, pliers, crowbar, wheelbarrow, shovel

2) Things which make work easier for mother; e.g., can opener, broom, mop, knife, tongs, fork, spoon, scissors

3) Things which make community work easier; e.g., crowbars, shovels, pump handles, balances

CONCEPT #5: Friction is used to start some stationary objects or to stop some moving objects.

The purpose of these experiences is to increase the children's understanding of friction. The children should be reminded that there is friction when an attempt is made to move one object over another, or when motion is achieved between two objects which are in contact with each other. An interesting approach experience might be a class discussion as to what there is in common with the following: striking a match, scouring a pot, wiping shoes on the doormat, sanding a floor, polishing silverware, sliding on a gym floor, writing with chalk on the blackboard, drawing a picture with crayons, sandpapering wood, and erasing a pencil mark from paper. As the class begins to have the learning experiences, the children should recognize rubbing is the thing in common.

A. Introductory

Experience 1: To recall samples of situations when smooth surfaces are necessary

List examples of occasions when sliding surfaces must be smooth because we want moving things to slide easily.

(Examples might include the smooth pole in the firehouse which makes it easy for firemen to slide down; smooth ice which helps us to skate more easily; the smooth metal on a slide which helps us to go down rapidly; and snow-covered hills which make sledding and tobogganing fun.)

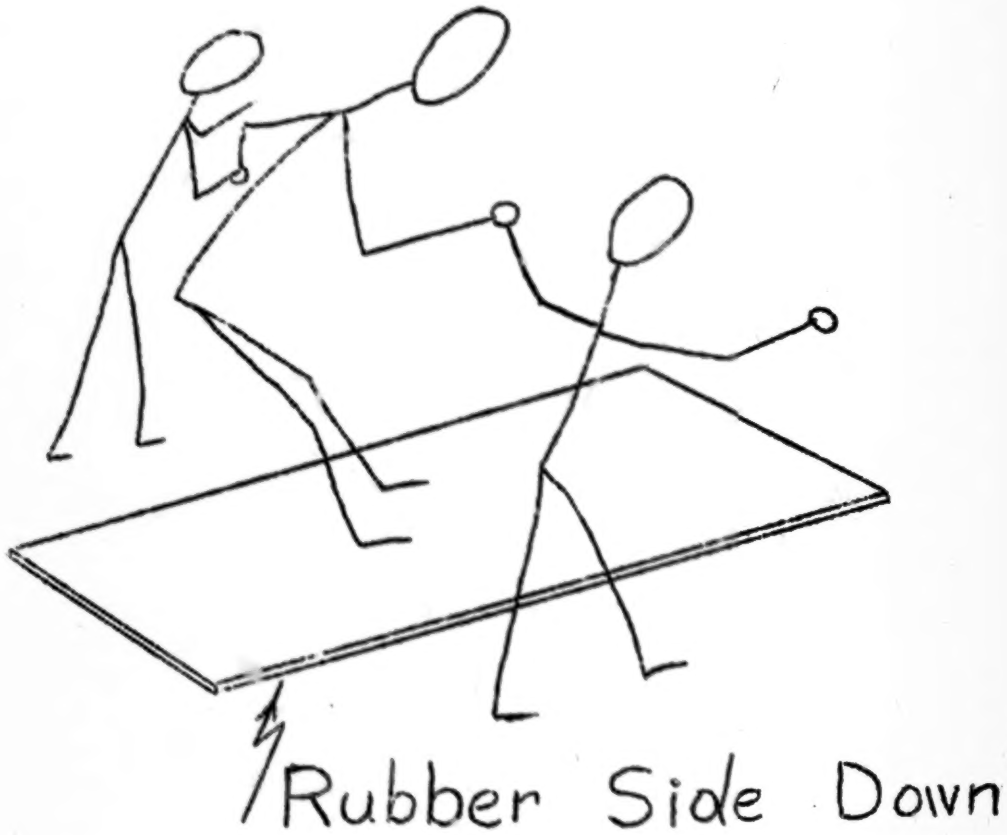
Experience 2: To suggest the importance of increased friction for the safety of cars

Discuss the following questions:

1) Why do cars slip and slide on the smooth ice?

2) Why is coarse sand or gravel put on icy streets and highways?

3) What does the coarse sand or gravel do to the ice? Is the ice smooth when the coarse sand or gravel is on it?


Rubber Side Down

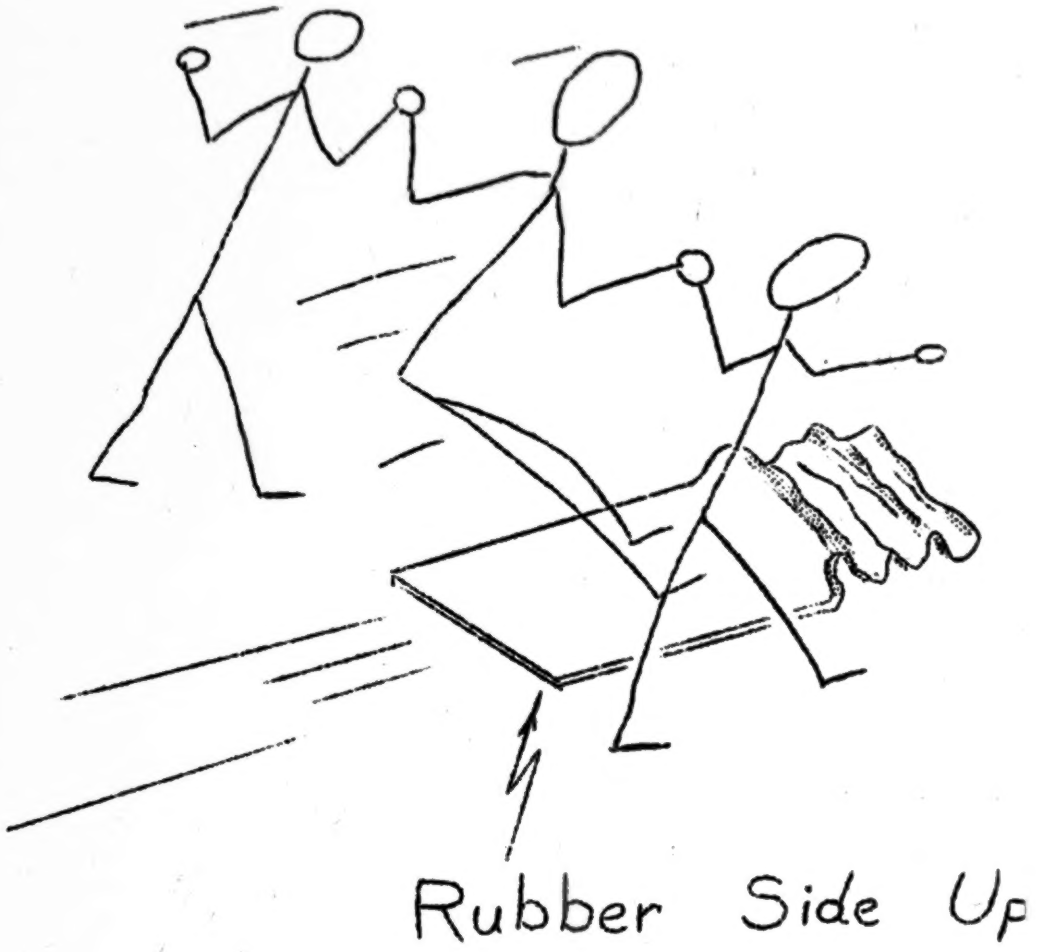

Rubber Side Up

Diagram for Experience 1 - Page 51

B. Developmental

Experience 1: To illustrate the effect of friction on sliding objects

Materials needed:

Rug, small, with rubber backing, 2' x 2' minimum

What to do:

Examine the rug. Point out the difference between the two sides. Place the rubber side of the rug down on a smooth floor.

Have two children stand so the rug is between them and they are not standing on the rug. Have these two children take hold of a third person's hands to keep him from falling.

Have the third person take two short running steps across the floor, while the two children still hold his hands, and suddenly stop on the rug. See diagram.

Turn the rug over. Repeat, using the rubber side of the rug up, away from the smooth floor. Be sure the two children remember to hold the third child's hands at all times. See diagram.

Compare what happens during each trial when you come to a sudden stop on the rug.

Discovering that:

Increased friction tends to decrease sliding.

Experience 2: To discover how uneven surfaces help when you start and stop running

Materials needed:

Shoes, gym, with tread
Overshoes
Shoes, leather soled

What to do:

Observe the treads on new gym shoes and the soles without tread on leather shoes.

Go out on the playground. Discover whether it is easier to start running and stop running when wearing rubber soled shoes with tread or leather soled shoes. Explain why it is important that you have shoes that don't slide easily as you run and stop.

Look at the soles on overshoes. Explain why new overshoe soles are rough.

Discovering that:

Rough soles (tread) on footwear increase the friction on the dirt of the playground. Overshoes, when new, have rough soles to increase friction while walking in snow and on ice.

Experience 3: To discover that treads may affect the amount of friction and can enable heavy objects to start and stop

Materials needed:

Tires on cars, bicycles and truck tires (can be observed at the neighborhood garage or in the school parking area)
Tires on toy trucks, toy fire engines, wagons, tricycles

What to do:

Examine the treads on tires. Discover whether all tires have treads.

Explain how treads help a car, truck or bicycle get started or to stop; why it is dangerous to have tires that have smooth treads; and why truck tires have deeper treads than car tires.

Discovering that:

Friction is used to enable heavy objects to start and stop. Rough surfaces do not slip as much as smooth surfaces.

Experience 4: To show that friction is needed to make it possible to unscrew a cap from a bottle

Materials needed:

Soap
Water
Jar, fruit (with screw-type lid)

What to do:

Screw the lid onto the jar as tightly as you can. Try to unscrew it.

Put the lid on tightly again. Wet your hands with water and soap. Try to unscrew the lid.

Compare the results of both tries.

Discovering that:

It is difficult to unscrew the lid with wet, soapy hands. Friction is needed to make it possible to twist the lid off a fruit jar.

C. Culminating

Experience 1: To become aware that decreased friction may result when elements of the weather change the surface of the streets

Discuss the following questions:

1) Why is it dangerous for children to ride their bicycles on wet, snow-covered or icy streets and sidewalks?

2) Why does a bicycle slide on a wet or icy sidewalk?

Experience 2: To review some common methods used by drivers to aid starting and stopping

Discuss the following questions:

1) Why do we see cars and trucks with snow tires or chains on their tires in winter?

2) How do chains and snow tires help the car to get started or help it to stop?

3) Why is it hard to get a car started in mud, snow, or sand without chains or snow tires?

Experience 3: To summarize ways in which increased friction is useful

List examples of situations in which surfaces must be made rough so that objects can slow down or are stopped from sliding or slipping. Examples might include the following:

Rough rubber mats which are placed in bathtubs to keep people from slipping on the wet smooth surface of the tub

Sand or gravel which is put on icy roads to decrease slipping and skidding of cars

Handles of baseball bats and hockey sticks which are often taped to keep the bats from slipping out of the hands of the batters when they swing at the ball

The hairs of the violin bows which are rubbed with resin to cause the bow to momentarily stick to the strings as the violin is played

Stairs which are often covered with rough metal or rubber treads to prevent people from slipping

Tires on bicycles, cars and trucks which have treads to help them slow down or stop without slipping

Railroad engines which drop sand on the smooth tracks to enable trains to start

CONCEPT #6: If a surface is rough, friction is greater; if a surface is smooth, friction is less.

The purpose of these experiences is to help the children associate the amount of friction with the smoothness of the surfaces which are rubbed together.

A. Introductory

Experience 1: To discover that some objects are smoother and others are rougher

Materials needed:

Objects with smooth surfaces
Objects with rough surfaces
Magnifying glass

What to do:

Observe the surfaces of the objects with the magnifying glass.

Arrange the various surfaces into two groups, smoother and rougher.

Discovering that:

Different surfaces vary in smoothness or roughness.

B. Developmental

Experience 1: To compare the effort needed to pull an object over a smooth and a rough surface

Materials needed:

Rubber band
Board, 2" x 4" x 4" long
Tack, thumb
Objects with rough surface (piece of an orange crate from the grocery store, the sidewalk, or playground blacktop)
Objects with smooth surface (window pane, table top, floor)

What to do:

Tack the rubber band to the block of wood. Pull on the rubber band to move the block of wood over the smooth surface. Note how much the rubber band stretches when the block of wood is moving.

Pull the block of wood over the rough surface and observe the lengthening of the rubber band as the block is moved.

Repeat the experiment using different pairs of materials.

Summarize the results.

Discovering that:

Less work is required to move something over a smooth surface than over a rough surface. Smooth surfaces offer less friction.

Experience 2: To compare the amount of friction produced by a rough and a smooth surface

Materials needed:

Ball, tennis (fuzzy)
Ball, rubber (smooth) of the same size
Bowl
Water

What to do:

Examine the surfaces of the two balls.

Pour water into the bowl until it is about 2" deep.
Twirl the balls, one at a time, in the water.
Notice how long each one spins.

Compare the times.

Discovering that:

A smooth surface moves through water more easily than a rough surface.

Experience 3: To illustrate a method of smoothing a surface

Materials needed:

Cookie sheet or other flat smooth metallic surface
Board, 2" x 4" x 2' long
Bottle, small, flat-sided (medicine bottle)
Water
Soap
Toweling, paper

What to do:

Make a slanting "road" (inclined plane) of the cookie sheet by putting one end on the board. Place the other end on a piece of paper toweling.

Adjust the slant so that the bottle needs only a very slight push to start it sliding down the inclined plane.

Wet the left half of the cookie sheet, keeping the right half dry. (Use paper toweling to wipe dry any spilled water.)

Soap the wet side and slide the bottle down. (The bottle slides more easily down a dry cookie sheet than down a wet, unsoaped cookie sheet because the surface tension of a thin film of water tends to prevent sliding. Therefore, to avoid confusion, do not compare the sliding of the bottle on a wet and a dry cookie sheet.)

Note whether the soap makes the bottle slide down faster. (Carpenters sometimes use soap to make their work easier. Nails or screws can be driven into hard wood more easily when rubbed with soap.)

Compare the ease and speed with which the bottle slides in each try.

Discovering that:

Wet, soapy things are slippery because water fills the low places. Water and soap on some surfaces make the friction less.

Experience 4: To discover how a decrease of friction increases enjoyment in some kinds of play

Materials required:

Slide, playground
Paper, wax

What to do:

Slide down the slide and note your speed.

Place a piece of wax paper on the top of the playground slide. Sit down on the paper. Slide to the bottom. Repeat many times.

Slide again without the wax paper. Observe any difference in speed.

Explain how the fun in the winter sports of skating, skiing and sledding depends on smooth surfaces.

Discovering that:

Waxing a metal slide usually makes it smoother and increases the rate of sliding.

Note: This experience could be broadened by sliding on grassy hills with ordinary cardboard and with cardboard coated with paraffin. A comparison of the speed of sliding should be made.

CONCEPT #7: Friction always produces two effects: heat and wear.

The purpose of these experiences is to enable the pupils to obtain an understanding that heat and/or wear are produced by friction. Some of the experiences indicate the relationship between the amount of friction and the amount of heat and/or wear while other experiences illustrate some beneficial or detrimental effects of friction.

A. Developmental

Experience 1: To discover heat is produced when objects rub together

Materials needed:

Magnifying glass

What to do:

Observe your skin with a magnifying glass to see that it is not perfectly smooth.

Rub your hands together to feel the warmth caused by friction.

Discovering that:

Friction produces heat. Rubbing two things together makes them both warm.

Experience 2: To show friction produces heat when a nail is pulled from a board

Materials needed:

Board, 2" x 4" x 2' long
Nails, 6 pennyweight
Hammer

What to do:

Pound a nail into the board.

Pull out the nail with the claw end of the hammer. Feel immediately the part of the nail that has been in the wood. (A cloth or jacket may be put over the nail being pulled to prevent it from flying loose.)

Discovering that:

When a nail is driven into wood or pulled from wood, friction is produced. If the nail has been pounded in and pulled out rapidly, heat can be felt.

Experience 3: To illustrate the influence of the surface and the speed of movement on the amount of heat produced

Materials needed:

Rope, thick, 1' long minimum
Pipe, metal, smooth, 1' long, minimum (the same outside diameter as the rope)

What to do:

Examine the surface of the rope and pipe. Grasp the rope firmly with one hand. Pull the rope through your hand slowly. Observe the heat on your hand.

Grasp the pipe tightly in one hand. Pull the pipe through your hand slowly, at the same speed you used with the rope. (To avoid getting painful "rope burns", do not pull either the rope or the pipe very rapidly.)

Discovering that:

A smoother surface does not produce as much heat as a rougher surface. The faster two things are rubbed together, the hotter they feel.

Experience 4: To discover that wood can be worn away by rubbing with sandpaper and that sanding wood produces heat

Materials needed:

Board, 2" x 4" x 4" long
Sandpaper

What to do:

Rub the sandpaper on the wood very rapidly.

Touch the part of the wood that has been sanded immediately. Feel the heat.

Continue rubbing until an indentation has been made into the wood.

Notice that sawdust is made up of pieces of wood worn off the block of wood.

Discovering that:

Rubbing wood with sandpaper produces heat and wears away the wood.

Experience 5: To observe wear produced by materials which rub against one another

Materials needed:

Stones, small, rough
Water
Jar, glass (with rubber seal and screw cap)

What to do:

Observe the surface of the stones. Draw a diagram of the shape of one "special stone" that is easy to identify and newly broken.

Place the stones in the jar until it is about 1/3 full. Add enough water to cover the stones. Cap and seal the jar.

Take turns shaking the jar. Shake it at recess, before school, and after school for about two weeks; or carry the jar in the car (the motion will cause shaking).

Pour out the water into another jar. Observe whether the water is cloudy. Allow the water to stand 30 minutes. Observe what has settled to the bottom of the water.

Observe the surface of the stones. Find your "special stone". Compare its shape to the picture you drew.

Collect some stones from a creek bottom. Compare their surfaces to the surfaces of your smooth stones.

Discovering that:

Friction causes the stones to be worn away and smoothed. Friction helps form soil. Friction is not always caused by machines.

Experience 6: To show that all rough surfaces do not produce the same amount of wear

Materials needed:

Sandpaper
Stone, rough
Board, rough surfaced, soft wood (pine)
Glass, flat piece (window pane, side of aquarium, or mirror)
Cotton, fluffy (absorbent)
Cloth, cotton
Board, 2" x 4" x 4" long
Hammer
Nails, ½"

What to do:

Rub a fluffy ball of cotton on the four different surfaces. Note what happens when the cotton is rubbed on the different surfaces.

Compare the amounts of cotton clinging to each surface.

Wrap the cloth around the block of wood 2" x 4" x 4". Nail the cloth firmly in place. Rub different parts of the cloth on each of the four different surfaces for 5 strokes.

Compare the amount of wear caused by each surface.

Discovering that:

More cotton is worn away by rough surfaces. Rough surfaces wear away cloth from pants or skirts.

Experience 7: To compare the wear produced by surfaces which have different amounts of roughness

Materials needed:

Sandpaper (grades ranging from fine to coarse)
Board, rough surfaced, soft wood (pine)

What to do:

Use the same pressure in all three of the following:

1) First rub the board with fine sandpaper. Count the strokes. Limit the strokes to ten.
2) Use the next coarser grade of sandpaper and rub a different area ten strokes.
3) Repeat, using each grade of sandpaper in turn.

Observe the difference in the amount of wood dust produced and the smoothness of the board.

Discovering that:

With a given amount of pressure, the rougher sandpaper produces more wear. The more friction between the moving objects, the more wear.

Experience 8: To prove the amount of wear depends on the roughness of the surface

Materials needed:

Chalk, unused, 8 pieces
Glass, flat piece (a window pane, the side of an aquarium, or a mirror)
Board, 2" x 4" x 2' long
Chalkboard
Sandpaper
Yardstick
Sidewalk

What to do:

Scribble with chalk on each of five surfaces (glass, wood, blackboard, sandpaper, sidewalk) for the same length of time. Use a new piece of chalk for each different surface. Note the wear on the five pieces of chalk.

Examine the surfaces that you rubbed the chalk against. Compare the amount of wear on the chalk to the roughness of the surface.

Use a new piece of chalk to make 5 lines on the sidewalk. Have each line one yard long. Compare the chalk to an unused piece. Notice how much of the chalk is worn down.

Repeat the procedure with another piece of chalk on the blackboard.

Examine the surfaces used in the experiment. Compare the three pieces of chalk to see how much each of the two pieces of chalk were worn down.

Discovering that:

Different surfaces wear chalk away at different rates. Friction causes things to wear away. Rough surfaces usually offer more friction. More wear results from greater friction.

Experience 9: To compare the effectiveness of different surfaces for cleaning a smooth surface

Materials needed:

Handkerchief, cotton
Cloth, smooth (nylon or silk), 8" x 8"
Wash cloth, terry cloth
Soap
Water
Soil, for potting plants

What to do:

Examine the surface of the smooth cloth, the handkerchief, and the wash cloth.

Mix the soil with your hands and then use the smooth cloth in washing your hands.

Mix the soil again with your hands and wash them, using the cotton handkerchief.

Repeat, using the rough wash cloth.

Have several other children repeat the experiment. Observe whether it is easier to get clean using the smooth cloth, the handkerchief, or the terry cloth wash cloth.

Decide which type of material makes more friction. Determine whether friction helps get your hands clean.

Discovering that:

Rough pieces of cloth may be an efficient aid to cleaning hands. Increased friction may be used to speed cleaning.

Experience 10: To show that rough surfaces may be used as an aid to cleaning

Materials needed:

Pot, or fry pan, aluminum or cast iron that has food stuck on it
Cloth, smooth (nylon or silk), 8" x 8"
Cloth, dish
Pad, scouring (steel wool or plastic)

What to do:

Examine and feel the surfaces of the piece of smooth cloth, the dish cloth, and the scouring pad to determine which is the roughest.

Do not wet the cloth or pan. Rub the food clinging to one part of the pan with the smooth cloth 5 strokes.

Repeat, using the dish cloth and then the scouring pad, each on a different part of the pan.

Observe which surface removes more food on the pan.

Discovering that:

The rougher material leaves less food on the pan. Rough surfaces can produce more friction than smooth surfaces with the same amount of rubbing.

B. Culminating

Experience 1: To call attention to examples of materials which are worn away by friction

a. Discuss the questions:

1) What kinds of workmen wear clothing which is worn out rapidly as they work? Typical answers might be: "Bricklayers wear out gloves." "Carpenters wear out the knees of their pants."

2) What are some things made to wear away a substance? Typical answers might be: "fingernail file", "food grater".

3) What kinds of machines are made to purposely wear away materials? Typical answers might be: "floor scrapers or sanders", "lawn mower sharpeners", "grinders".

b. Collect and display articles that show evidence of wear. (Suggestions for materials are paper with erasures; used chalk; pencils in need of sharpening; soles of shoes with holes; old car or bicycle tires with worn treads; an old broom; an old rug; pants worn out at the knee; an old paint brush.)

Experience 2: To review the importance of the surface and the speed of movement on the amount of heat produced

Discuss the questions:

1) How is sliding down a gym rope different from sliding down a fireman's pole?

2) How does the surface of the rope compare with the surface of the fireman's pole?

3) Why is the fireman's pole polished smooth?

4) Why do most firemen wrap their arms and legs around the pole?

III. EVALUATION

A. Evaluation of the individual child's learning by the teacher

1. Is the child more aware of inclined planes, levers and friction?
2. Does the child try to identify inclined planes, levers and friction in places which have not previously been called to his attention?
3. Does the child respond satisfactorily to informal oral quizzing?
4. Can the child do well on written examinations on facts and concepts included with the unit?
5. Can the child make acceptable contributiors to class discussions about the unit's content?
    a. Can he clarify his understandings of the concepts in the unit to a classmate?
    b. Does he use the minimum vocabulary of this science unit?
    c. Can he explain to guests the science understandings included in his displays and in the unit?
    d. Does he feel the need for, look for, and use more accurate words than previously in explaining his understandings?
6. Does the child raise pertinent questions concerning the study throughout the unit?
7. Does the child participate actively and constructively in the planning, experimenting and discussion?
8. Does the child demonstrate accuracy and completeness of science understandings in written and oral science reports which are dependent on the content of this unit?
9. Does the child apply the science understandings to activities not included in the unit?

B. Self-evaluation of the teacher's success with the unit

1. Are the children more aware of inclined planes, levers and friction?
2. Do the children try to identify inclined planes, levers and friction in places which have not previously been called to their attention?
3. Do the children respond satisfactorily to informal oral quizzing?

4. Can the children do well on written examinations on facts and concepts included with the unit?

5. Can the children carry on acceptable discussions about the unit's content?

   a. Can they clarify to each other the concepts in the unit?

   b. Do they use the minimum vocabulary of this science unit?

   c. Can they explain to guests the science understandings included in their displays and in the unit?

   d. Do they feel the need for, look for, and use more accurate words than previously in explaining their understandings?

6. Do the children raise pertinent questions concerning the study throughout the unit?

7. Do the children participate actively and constructively in the planning, experimenting and discussion?

8. Do the children strive for and demonstrate accuracy and completeness of science understandings in written and oral science reports which are dependent on the content of this unit?

9. Do the children apply the science understandings to activities not included in the unit?

10. Are the children beginning to show scientific attitudes toward phenomena?

    a. Do they ask what, how and why?

    b. Do they ask questions more frequently?

    c. Do they bring things related to the unit to show and place on the science table?

    d. Do they ask questions as a result of their own observations?

    e. Are they accurate in their observations and science information?

    f. Are they accurate in recording observations?

11. Do the children have an enthusiasm for learning?

12. Are the children now more interested in inclined planes, levers and friction than they were when the study was begun, or has their interest decreased?

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Written for grades three through seven
pp. 110-111, inclined planes

Schneider, Herman and Nina. Now Try This to Move a Heavy Load, Wm. R. Scott, Inc., 1947.
Much usable information and experiments - written for grades four through seven
pp. 4-19, excellent section on friction - very useful for teacher to guide students' work
pp. 20-27, good for levers and inclined planes

Schneider, Herman and Nina. Science Far and Near, Heath, 1954.
Third grade science textbook with a number of usable ideas
pp. 243-249, levers
pp. 256-258, inclined planes

Schneider, Herman and Nina. Science in Our World, Heath, 1955.
A fifth grade science textbook for teacher use
pp. 218-221, levers

Schneider, Herman and Nina. Science in Your Life, Heath, 1955.
A fourth grade science textbook that can be very useful for the teacher - many experiments that can be used for second grade
pp. 36-41, pp. 54-56, friction

Sharp, Elizabeth N. Simple Machines and How They Work, Random, 1959.
Vocabulary within ability of better readers - simple, clear illustrations
pp. 41-49, inclined planes
pp. 65-69, levers

Syrocki, Boleslaus John. What is a Machine?, Benefic Press, 1960.
A book written for fourth grade which is usable for the teacher
p. 13, friction
pp. 20-30, levers
pp. 35-38, inclined planes

Thurber, Walter A. Exploring Science - Six, Allyn & Bacon, 1955.
A sixth grade science textbook useful for teacher information and ideas for classroom activities
pp. 108-113, inclined planes
pp. 118-123, levers
pp. 126-129, friction

UNESCO Source Book for Science Teaching, UNESCO Publications,
801 Third Avenue, New York 22, New York, 1956.
pp. 108-109, levers
p. 111, inclined planes
p. 113, friction

B. FILMS

Circus Day - Arthur Barr Productions, 1949.
21 min., color, sound.
Use the first four minutes of this film to illustrate the use of ramps for unloading circus animals and wagons from the train.

Simple Machines: The Inclined Plane Family - Encyclopedia Britannica Films, 1960. 11 min., color, sound.
Use this film only to the beginning of material on wedges.

Note: There are no films on this subject on the primary level at the Public Library. This film is difficult for the average second grader.

C. FILMSTRIPS

Levers (Simple Machines Help Us Work), Jam Handy Organization, 1958.
18 frames, color, 35 mm.
Explains what a lever is and how it works. Illustrates parts of a lever.

Ramps (Simple Machines Help Us Work), Jam Handy Organization, 1958.
18 frames, color, 35 mm.
Explains what a ramp is and how ramps make work less difficult. Emphasizes the uses of ramps.

V. SUMMARY LIST OF MATERIALS NEEDED

Ball, fuzzy tennis
ball, smooth rubber (same size as tennis ball)
blindfold
board, 1" x 4" x 29" long
board, 1" x 4" x 6' long
board, 2" x 4" x 4" long
board, 2" x 4" x 2' long
board, rough surfaced, soft wood (pine), height of the teacher's desk (1" x 4" x 29" long)
book end
books
bottle, small, flat-sided (medicine bottle)
bowl
brick
bus fare

Cardboard, stiff (size to fit door of cattle car on toy train)
cardboard, thin
carton, large cardboard
carton, cardboard, strong
chair, student
chalk, unused, (8)
chalkboard (blackboard)
cloth, cotton
cloth, smooth (nylon or silk) 8" x 8"
cookie sheet
cord, heavy
cotton, fluffy (absorbent)

Desk, student (5)
desk, teacher
dish cloth

Glass, flat piece (window pane, side of aquarium, or mirror)

Hammer
handkerchief, cotton

Jar, glass, with rubber seal and screw top
jar, fruit, with screw-type lid

Log, short chunk, 12" diameter minimum

Magnifying glass

Nails, ½"
nails, 6 pennyweight
nails, 8 pennyweight
nutcracker
nuts, hard-shelled

Objects with smooth surfaces (piece of window pane, waxed table top, waxed floor)
objects with rough surfaces (piece of orange crate, sidewalk, playground blacktop)
overshoes

Paper, wax
pipe, metal, smooth, 1' long
planks, 2" x 10" x 8' long (2)
(if the school has a rocking board not in use, it is possible this plank might serve)
pot, or fry pan, with food stuck on it (cast iron or aluminum)

Rope, thick, 1' long
rubber band
rug, small, with rubber backing, 2' x 2' minimum
ruler, rigid

Sandpaper (grades ranging from fine to coarse)
scale, spring balance
scissors
scouring pad
sheet metal
shoes, gym, with tread
shoes, leather soled
sidewalk
slide, playground
soap
soil, for potting plants
spikes, 30 pennyweight (18)
stepladder, about 5'
stone, which weighs less than the brick
stones, small, rough

Table, about 30" high
tack, thumb
teeter totter
tin snips
tires on car, bicycle, truck (can be observed in neighborhood garage or school parking lot)

Tires on toy trucks, toy fire engines, wagons, tricycles
toweling, paper
toy animal cages (make from shoe boxes)
toy circus animals
toy train
toy truck or wagon
toy wheelbarrow

Wash cloth, terry cloth
water
wood block, triangular, for fulcrum (cut lumber one piece, 2" x 2" x 4" maximum length. Cut lengthwise on diagonal of the end cross section)
wood block, triangular, (8) (cut lumber 4" x 6" x 9". Cut lengthwise on diagonal of the end cross section. Cut to 9" lengths)
wood blocks, ½" x ½" x 1" long (4)
wood cleats, ½" x 2" x 9" long (8)

Yardstick

Typed by NM

BIBLIO. - BOOKS

For discussion purposes only

A SELECTIVE BIBLIOGRAPHY

of

BOOKS FOUND USEFUL

in the

TEACHING OF THE SCIENCE UNITS

for
Grade Two

Correlated to the Unit Titles as found in the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department
8-24-64

For discussion purposes only

Grade Two

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D. Understanding ourselves	16	Green
III. Energy		
A. How sound travels	17	Yellow
C. Magnets and what they do	19	Yellow
D. Things that help and hinder work	20	Yellow
IV. The Universe		
A. What we see in the sky	21	Blue
B. Movements of the earth	22	Blue

The annotations for books found on the following pages were obtained from many bibliographies which were consulted in the preparation of this list.

Introduction to Science

Using Science	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Bongiorno, M. M. and Gee, M. 1963 HOW CAN I FIND OUT? ** Children's Press. $2.50 It develops skills that would be useful in all future experiences and experiments in science.		X		2-3
Challand, Dr. Helen, and Elizabeth Brandt. 1963 SCIENCE ACTIVITIES FROM A TO Z ** Children's Press. $5.50	X		X	
Podendorf, Illa. 1960 PROJECTS AND EXPERIMENTS ** Children's Press. $4.50 101 Science Experiments with air, magnets, electricity, water, heat, sound, light, machines, chemistry, plants, etc.	X		X	
Selsam, Margaret E. 1963 GREG'S MICROSCOPE * Harper & Row. $2.19 Greg, who receives a microscope, makes slides from common objects around the house and is entranced by what he sees. Accurate information simply presented with a touch of humor for the beginning independent reader.		X	X	2-3

* Good
** Excellent

Introduction to Science (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Vergara, William C. 1958 SCIENCE IN EVERYDAY THINGS ** Harper. $4.95 Answers to hundreds of interesting and scientific questions.	X			

* Good
** Excellent

I. The Earth

A. Water appears and disappears	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Black, Irma S. 1958 BUSY WATER ** Holiday. $2.75 Beginning with rain falling on a high hill, text and pictures trace the water cycle to tell where the rain came from and some of the uses of water.	X	X		2-3
Herbert, Don and Ruchlis, Hy. 1960 BEGINNING SCIENCE WITH MR. WIZARD: WATER * Doubleday. $1.25 The book contains straight-forward explanations, illustrated experiments, and demonstrations.	X		X	
McGrath, Thomas. 1959 CLOUDS ** Melmont Publications. $2.50 For second graders.	X	X		2-3
Wyler, Rose and Ames, Gerald. 1963 PROVE IT ** Harper. $2.19 Full of experiences and experiments that are written in simple language and illustrated in an exciting presentation of color and activities.		X	X	2-3

* Good
** Excellent

II. Living Things

A. Animal behavior	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Allen, Gertrude E. 1943 EVERYDAY BIRDS * Houghton. $2.23 This book tells simple facts about six common birds -- robins, crows, chickadees, woodpeckers, ducks, and wrens. The pictures are large and clear and will help give a child the fun of recognizing them.		X		Read to Class
Barker, Will. 1956 FAMILIAR ANIMALS OF AMERICA ** Harper. $4.95 A well-written, authoritative guide to the subject.	X	X		
Bartlett, Ruth. 1957 INSECT ENGINEERS ** Morrow. $3.00 The anatomy, social habits, and engineering feats of various kinds of ants.	X	X	X	
Conklin, Gladys. 1962 WE LIKE BUGS ** Holiday House. $2.95 About twenty-five insects are presented in bright, simple text with softly colored drawings. Only the insect behavior which the very young observer can discover himself is given.		X		Read to Class

* Good
** Excellent

II. Living Things - A. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Darling, Louis. 1956 PENGUINS * Morrow. $2.78 Depicts penguins in their natural habitat and explains what the arrival of man has done to them.	X	X		2-3-4
Goudey, Alice E. 1959 HERE COME THE RACCOONS * Scribner. $2.75 Describes through a narrative account of one family the life cycle and habits of the raccoon.	X	X		4
Jordan, E. L. 1952 HAMMOND'S NATURE ATLAS OF AMERICA ** Hammond. $4.95 Information on the plants and animals to be found in this country.	X	X		
McClung, Robert M. 1954 BUFO: THE STORY OF A TOAD ** Morrow. $2.78 The first three years of the life of a toad.		X		2-3

* Good
** Excellent

II. Living Things - A. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
McClung, Robert M. 1958 ALL ABOUT ANIMALS AND THEIR YOUNG * Random. $1.95 How different kinds of animals reproduce and care for their young. Includes examples of "simple" animals as well as insects, birds and mammals.	X	X		
Posell, Elsa. 1958 THE TRUE BOOK OF DESERTS * Children's Press. $2.00 General characteristics of deserts and some of the plants and animals which inhabit them. Many large illustrations and easy-to-read text.				2
Shuttlesworth, Dorothy E. 1955 THE STORY OF SPIDERS ** Doubleday. $2.95 An interesting discussion of the structure and life of various kinds of spiders.	X	X		
Webb, Addison. 1947 BIRDS IN THEIR HOMES. ** Doubleday. $2.95 The stories of many different varieties of birds and the homes they build.	X	X		2-3

* Good
** Excellent

II. Living Things - A. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Williamson, Margaret. 1951 THE FIRST BOOK OF BIRDS ** Watts. $2.50 An easy introduction to birds and their habits.	X	X		3-4
Zim, Herbert S., and Ira N. Gabrielson. 1956 BIRDS ** Simon & Schuster. $2.99 (paper - $1.00) A well-illustrated guide to classification.	X	X		
Zim, Herbert S. 1950 FROGS AND TOADS ** Morrow. $2.78 An elementary introduction.	X	X		2-3

* Good
** Excellent

SCIENCE RESOURCE BOOK BIBLIOGRAPHY - Grade Two (Addendum)

Addition to Page 7

II. Living Things

A. Animal behavior	Tchr. Ref.	Illus.	Learning Activities	Pupil Interest	Reading Level
Hogner, Dorothy Childs 1953 EARTHWORMS ** Crowell $2.90 Describes how earthworms live and how to set up a worm farm.	X				
Mason, George F. 1947 ANIMAL HOMES ** Morrow $2.78 A survey of some of the many unusual homes which animals occupy.	X				

* Good
** Excellent

II. Living Things

B. Animals have young	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Allen, Gertrude. 1963 EVERYDAY INSECTS * Houghton. $2.57 The book covers six common insects, pointing up their differences and similarities, their habits, their life cycles, and the various ways in which they survive their enemies.	X	X		2-3
Barker, Will. 1956 FAMILIAR ANIMALS OF AMERICA ** Harper. $4.95 A well-written, authoritative guide to the subject.	X	X		
Conklin, Gladys. 1962 WE LIKE BUGS * Holiday. $2.95 About twenty-five insects are presented in brief, simple text with softly colored drawings. Only the insect behavior which the very young observer can discover himself is given.		X		Read to Students
Gregor, Arthur. 1959 ANIMAL BABIES * Harper. $3.27 This handsome collection of photographs of animal babies shown with their mothers would be useful for units on the farm and the zoo.	X	X		1-2

* Good
** Excellent

II. Living Things - B. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Hogner, Dorothy Childs. 1956 FROGS AND POLLIWOGS ** Crowell. $2.90 What a frog is, how it grows and metamorphoses, where it lives, what it eats, and how to study tadpoles and frogs, first-hand.	X	X	X	Read to Students
Hussey, Lois J. 1953 COLLECTING COCOONS ** Crowell. $3.20 Information on the lives of moths and directions for studying them.	X	X	X	Read to Students
Jordan, E. L. 1952 HAMMOND'S NATURE ATLAS OF AMERICA ** Hammond. $4.95 Information on the plants and animals to be found in this country.	X	X		
Lemmon, Robert S. 1956 ALL ABOUT MOTHS AND BUTTERFLIES ** Random. $1.95 A thorough study of the life cycles of moths and butterflies.	X			

* Good
** Excellent

II. Living Things - B. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Marcher, Marion W. 1954 MONARCH BUTTERFLY ** Holiday. $2.75 The life story of a typical butterfly.	X	X	X	3-4
Mason, George F. 1961 ANIMAL BAGGAGE * Morrow. $2.78 Another in Mr. Mason's series of books on physical characteristics and behavior of animals. How animals transport food, their young and homemaking materials is informally discussed in a combination of anecdote and fact.	X	X		
McClung, Robert M. 1958 ALL ABOUT ANIMALS AND THEIR YOUNG * Random. $1.95 How different kinds of animals reproduce and care for their young. Includes examples of "simple" animals as well as insects, birds and mammals.	X	X		
McClung, Robert M. 1953 TIGER: THE STORY OF A SWALLOWTAIL BUTTERFLY * * Morrow. $2.78 How a caterpillar emerges from his egg, grows, becomes a chrysalid and finally appears as a mature swallowtail butterfly.	X	X		Read to Class

* Good
** Excellent

II. Living Things - B. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Schloat, G. Warren, Jr. 1952 THE WONDERFUL EGG ** Scribner. $2.95 A good description of the growth of a chicken from its earlier stages.	X	X		2-3
Schwartz, Elizabeth, and Charles Schwartz. 1959 BOBWHITE FROM EGG TO CHICK TO EGG * Holiday. $2.75 An excellent description of the bobwhite's life cycle.	X	X		3-4
Weil, Ann. 1956 ANIMAL FAMILIES ** Children's Press. $2.50 A very simple introduction to families, with emphasis on the ordinary name of the male, female and young.	X	X		2-3
Williamson, Margaret. 1951 THE FIRST BOOK OF BIRDS ** Watts. $2.50 An easy introduction to birds and their habits.	X	X		3-4

* Good
** Excellent

II. Living Things - B. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Zim, Herbert S. 1950 FROGS AND TOADS ** Morrow. $2.78 An elementary introduction.	X	X		2-3

* Good
** Excellent

SCIENCE RESOURCE BOOK BIBLIOGRAPHY - Grade Two
(Addendum)

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II. Living Things

B. Animals have young	Tchr. Ref.	Illus.	Learning Activities	Pupil Interest	Reading Level
Nasca, Donald & Glenn Sprague 1964 ON SIX LEGS ** F. A. Owen Pub. Co. $1.90 A summer reading program encourages 3 children to read more about insects. Ants, bees, and common house-type insects are investigated	x	x			3-4

* Good
** Excellent

II. Living Things

C. How plants live and grow	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Cooke, Emogene. 1957 FUN-TIME WINDOW GARDEN ** Children's Press. $2.50 Growing plants in water and growing plants in soil are both discussed. Each suggested activity is outlined under headings such as What You Do, What to Watch For, and Things To Do. Simple, explicit instructions.	X	Good	Good	2-3
Cormack, Maribelle B. 1951 THE FIRST BOOK OF TREES ** Watts. $2.50 An introduction to differentiating characteristics of trees. Includes sections on the many uses to which trees are put, and information on conservation.	X	X		
Guilcher, J. M. and R. H. Noailles. 1960 A TREE IS BORN ** Sterling. $2.99 Follows development from seed of the horse chestnut, oak, walnut and pine.	X	X		
Jordan, E. L. 1952 HAMMOND'S NATURE ATLAS OF AMERICA ** Hammond. $4.95 Information on the plants and animals to be found in this country.	X	X		

* Good
** Excellent

II. Living Things - C. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Kirkus, Virginia. 1956 THE FIRST BOOK OF GARDENING ** Watts. $2.50 Helpful information on where and when to grow various plants.		X		
Selsam, Millicent E. 1957 PLAY WITH SEEDS ** Morrow. $2.78 From Seaweeds to Seed Plants, From Flower to Seed, How Seeds Travel, Experiments with Seeds, and Uses of Seeds are the chapter titles in this excellent book.	X		X	
Selsam, Millicent E. 1950 PLAY WITH TREES ** Morrow. $2.78 Simple projects which aid in understanding how trees grow and function	X	X	X	3-4
Selsam, Millicent E. 1959 SEEDS AND MORE SEEDS ** Harper. $2.19 Benny learns by experimentation and observation what seeds are, how they grew, where they come from, and how they are dispersed.		X	X	1-2-3

* Good
** Excellent

II. Living Things - C. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Wyler, Rose. 1957 THE GOLDEN PICTURE BOOK OF SCIENCE * Simon & Schuster. (Not in print) A picture book of science for younger children. Includes facts about animals, plants, weather, etc., and experiments and activities.	X			

* Good
** Excellent

SCIENCE RESOURCE BOOK BIBLIOGRAPHY - Grade Two
(Addendum)

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II. Living Things

C. How plants live and grow	Tchr Ref.	Illus.	Learning Activities	Pupil Interest	Reading Level
Blane, Gertrude 1965 FLOWER BOX MYSTERY ** Melmont Pub. Co. $2.00 This book is a thrilling story with pictures; valuable in elementary science programs for its information about growing plants in the city; conditions essential for plant life; and the economic value of plants.			X		Read to Student

* Good
** Excellent

II. Living Things

D. Understanding ourselves	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Hinshaw, Alice. 1959 YOUR BODY AND YOU ** Children's Press. $2.00 Simple text and illustrations explain the structure and function of the human body.	X	X		2-3
Weil, Ann. 1956 ANIMAL FAMILIES ** Children's Press. $2.50 Full-page color pictures of chickens, horses, cows, sheep, dogs, goats, donkeys, pigs, geese, ducks, turkeys and rabbits, with brief descriptive text. May also be used with pre-school children.	X	X		2-3

* Good
** Excellent

III. Energy

A. How sound travels	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Knight, David C. 1960 THE FIRST BOOK OF SOUND ** Watts. $2.50 Teaches boys and girls what causes sound and how it behaves.	X	X	X	
Pine, Tillie S. and Levine, Joseph. 1958 SOUNDS ALL AROUND ** Whittlesey. $2.63 An elementary explanation of sound--what causes sound, how it travels, how it can be pitched high or low, softened, made louder, or stopped and how it can be used for fun. Suggests experiments which utilize materials found in the home.	X	X	X	3-4
Podendorf, Illa. 1954 THE TRUE BOOK OF SCIENCE EXPERIMENTS ** Children's Press. $2.00 Simple experiments are explained in language readily understandable for young students. Experiments deal with magnetism, gravity, sound, and other physical phenomena.	X	X	X	2

* Good
** Excellent

III. Energy - A. (continued)	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Tannenbaum and Stillman. 1960 SOUNDS AND HOW THEY ARE MADE * Webster. 76¢ Completely covers the concepts to be taught in this unit. Much information given in simple language.	X	X		2-3
Wyler, Rose and Ames, Gerald. 1963 PROVE IT ** Harper. $2.19 Full of experiences and experiments that are written in simple language and illustrated in an exciting presentation of color and activities.		X	X	2-3

* Good
** Excellent

III. Energy

C. Magnets and what they do

	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Pine, Tillie S. and Levine, Joseph. 1958 MAGNETS AND HOW TO USE THEM ** Whittlesey. $2.63 Many diagrams help to explain the characteristics and uses made of various types of magnets.	X		X	3
Podendorf, Illa. 1954 THE TRUE BOOK OF SCIENCE EXPERIMENTS ** Children's Press. $2.00 Simple experiments are explained in language readily understandable for young students. Experiments deal with magnetism, gravity, sound, and other physical phenomena.	X	X	X	2
Reuben, Gabriel H. and Archer, Gloria. 1959 WHAT IS A MAGNET? ** Benefic. $1.80 Easily understood material covering the basic ideas of magnetism.	X		X	
Wyler, Rose and Ames, Gerald. 1963 PROVE IT ** Harper. $2.19 Full of experiences and experiments that are written in simple language and illustrated in an exciting presentation of color and activities.		X	X	2-3

* Good
** Excellent

III. Energy

D. Things that help and hinder work	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Lewellen, John. 1953 TOYS AT WORK ** Children's Press. $2.00 Toys can help with the beginning understanding of friction, gravity, sound, etc.		X	Good	2

* Good
** Excellent

IV. The Universe

A. What we see in the sky	Tchr. Ref.	Illus.	Learning Activities	Reading Level
ranley, Franklyn M. 1959 A BOOK OF MOON ROCKETS FOR YOU ** Crowell. $3.36 Explains how and why men will explore the moon.		X		2-3
Branley, Franklyn M. 1960 THE MOON SEEMS TO CHANGE ** Crowell. $2.35 Short sentences, easy terms and vocabulary discuss the size of the moon, its distance from the earth, and the reason for the phases of the moon.		X	X	2-3
Lewellen, John. 1954 THE TRUE BOOK OF MOON, SUN AND STARS ** Children's Press. $2.00 Basic astronomy for the very young.	X	X		2
Tannenbaum, Harold E. and Stillman, Nathan. 1960 EARTH AND SPACE ** Webster. 76¢ Well organized and illustrated book dealing with the Earth, its shape, gravity, and place in the solar system. Observation of the moon in its phases is encouraged.		X	X	2-3

* Good
** Excellent

IV. The Universe

A. What we see in the sky	Tchr. Ref.	Illus.	Learning Activities	Pupil Interest	Reading Level
Freeman, Mae 1959 YOU WILL GO TO THE MOON * Random $1.95 Illustrations and text produce the feeling of an actual trip to the moon.	X	X			1-2

* Good
** Excellent

IV. The Universe

B. Movements of the earth	Tchr. Ref.	Illus.	Learning Activities	Reading Level
Branley, Franklyn M. 1959 A BOOK OF MOON ROCKETS FOR YOU ** Crowell. $3.36 Explains how and why men will explore the moon.		X		2-3
Branley, Franklyn M. 1961 A BOOK OF PLANETS FOR YOU ** Crowell. $3.36 Designed to interest the young reader in the rotation of planets.		X		3-4

* Good
** Excellent

Grade Two

BASIC SCIENCE EDUCATION SERIES
Published by Row, Peterson & Co.

(Grade Placed for Major Topic in the Reorganized Science Curriculum)

		Reading Level
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	A. Water appears and disappears	
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	C. How plants live and grow	
	Plants Round the Year	2.8
	Watch Them Grow Up	2.0
III.	Energy	
	C. Magnets and what they do	
	Magnets	2.7
	D. Things that help and hinder work	
	Doing Work	3.4

JLP/db
10/18/67

BIBLIO. - FILMS

For discussion purposes only

A PARTIAL LISTING OF PRESENTLY OWNED

SCIENCE MOTION PICTURE FILMS

GRADE TWO

Correlated to the Unit Titles as found in the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department
3-12-65

For discussion purposes only

Grade Two

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D. Understanding ourselves ...... 20 Green

III. Energy

A. How sounds travel .... 23 Yellow
C. Magnets and what they do ..... 24 Yellow
D. Things that help and hinder work 25 Yellow

IV. The Universe

A. What we see in the sky .... 27 Blue
B. Movements of the earth .... 28 Blue

The annotations for films found on the following pages were obtained in most cases from the Library of Congress cards. Some annotations were secured from other sources such as the Educational Film Guide and producers' catalogs.

Introduction to Science

Using science

Name and Description of Film	Other Grade Placements	Remarks
1. Prove it With a Magnifying Glass ** Film Assoc. of Calif.; 11 min., color This film is designed as an introduction to the scientific method. This film was made for the young child. It uses a child's first science experiences with a simple instrument (the magnifying glass) to illustrate the concept: prove it yourself. For primary science classes.	K. - ** Gr. 1 - ** Gr. 3 - **	

* Good
** Excellent

I. Earth

Water appears and disappears

Name and Description of Film	Other Grade Placements	Remarks
1. Rain Int'l Film Bureau, 10 min., color The importance of water (rain) to plant life. Evaporation and condensation are introduced during a visit to a laboratory where a child is doing some individual experimentation. Pictures and discusses the effects of wind and sunshine on evaporation. Cloud formation, rainbows and showers add to the interest of the film. For primary grades.	Gr. 3 - **	No eval. yet

* Good
** Excellent

II. Living Things

A. Animal behavior

Name and Description of Film	Other Grade Placements	Remarks
1. Adventures of Bunny Rabbit * EBF, 1937; 10 min., black & white Portrays the life of a family of rabbits. Relates the adventures of young Bunny who, visiting a nearby farm in search of lettuce, encounters a frog, a squirrel, some cows, baby chickens, and other barnyard animals.	K - **	
2. Adventures of a Chipmunk Family ** EBF, 1958; 11 min. Shows how chipmunks live, what and how they eat, their enemies, and how they deal with them. Views the inside of an actual chipmunk den and follows an exciting chase by the animal's most dangerous enemy. Concludes with the family's preparations for winter; nest building, food storage, and the digging of escape passages.	Gr. 4 - ** Gr. 7 -	 No eval. yet
3. Animal Homes ** Churchill-Wexler, 1960; 11 min., color Shows a variety of animals making and using their homes for shelter, safety, food storage, and raising of young. Includes various birds, ants, a spider, gallfly, mole, gopher, opossums and coati.	Gr. 4 - **	Also listed II-B

* Good
** Excellent

II. Living Things - A. (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Animals in Autumn ** EBF, 1957; 11 min. Shows typical autumn activities of various animals including deer, foxes, rabbits, ground squirrels, raccoons, weasels, conies, coldblooded animals, birds, and insects, as they search for food, build homes, and prepare to migrate or hibernate during the winter months.	Gr. 4 - ** Gr. 7 - *	
5. Animals in Winter ** EBF, 1950; 11 min. Studies various wild animals as they prepare for and live through the winter season. Portrays a badger, woodchuck, chipmunk, caterpillar, owl, rabbit, bluejay, porcupine, bobcat, and fox in natural settings. Shows that some animals prepare winter homes for themselves, that some store food, that some hibernate, that some change in appearance as winter comes, and that some live through winter in a different form.	Gr. 4 - **	
6. Animals Move in Many Ways ** 11 min., color $120, b/w $60, Film Associates of Calif. Illustrates a few of the many different ways in which living things move about. Original music score. For science and language arts.	K. - ** Gr. 1 - **	

* Good
** Excellent

II. Living Things - A. (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. The Beaver ** EBF, 1950; 10 min., color Shows activities of the beaver in its natural environment. Illustrates ways in which the beaver's teeth, feet, and tail help him in swimming, eating, felling trees, and repairing a broken dam. Reveals the unique construction of a beaver house, and stresses the importance of the animal as an agent of conservation and as a valuable fur bearer.	Gr. 4 - ** Gr. 7 - **	
8. Bird Homes * EBF, 1960; 10 min., black & white Shows the beach and marsh homes of the least tern, killdeer, stilt, gull, pied-billed grebe, etc.; the meadow homes of the bobolink, spotted sandpiper, horned lark, meadow lark, and burrowing owl; the skyscraper homes of cormorants, puffins, duck hawks, flickers, etc.; and the homes of birds which build near the ground, such as the cuckoo, wood thrush, yellow warbler, redstart, and hummingbird.	K - ** Gr. 4 - *	
9. Birds: How We Identify Them ** Coronet, 1960; 11 min., color Follows two boys who, with field glasses and bird guide book, set out to look for birds. Shows how to distinguish one bird from another; by appearance; by the sounds they make, and by their actions, both on the ground and in the air. Points out the identifying characteristics of many of the more common birds, showing them in their natural habitat.	K - ** Gr. 5 - **	

* Good
** Excellent

II. Living Things - A. (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. Common Animals of the Woods ** EBF, 1943; 11 min., black & white Presents a study of various common animals in their natural habitat. Gives information as to appearance, size, adaptiveness, habitat, habits, and care of the young for such animals as the squirrel, rabbit, raccoon, porcupine, otter, mink, beaver, opossum, skunk, and woodchuck.	K - ** Gr. 7 - *	
11. Fall Brings Changes ** Churchill-Wexler, 1962; 11 min., color This film shows the adaptation of plants and animals to colder weather. Useful in the area of Language Arts. It is beautiful and poetic and will inspire many stories to enrich the child's imagination and vocabulary.	K - ** Gr. 1 - ** Gr. 4 - **	Also listed II-C
12. Life in an Aquarium ** Leonard Peck Prod., 1950; 11 min., black & white Elementary school children study an aquarium in order to learn how animals breathe and move about under water and how the tadpole develops into a frog.	Gr. 4 - ** Gr. 7 - *	Also listed II-B
13. Living and Growing * Churchill-Wexler, 1957; 11 min. Depicts what it means to "live and grow". As we watch Beano, Wendy, and their pets, the narrator explains that they all need food, shelter, and sleep. He points out the difference between things that are alive and those that are not.	K - **	Simple

* Good
** Excellent

II. Living Things - A. (continued)

Name and Description of Film	Other Grade Placements	Remarks
14. Migration of Birds ** EBF, 1960; 11 min., color Shows the yearly cycle in the life of a migrating bird. Discusses known facts and theories about the migration of the Canada goose--when, how, where, and why the birds migrate.	Gr. 4 - ** Gr. 7 - **	
15. The Olympic Elk ** Walt Disney, 1951; 27 min., color A photographic study of the Olympic elk which abound on the Olympic Peninsula in the State of Washington. Describes the life of the herd in the winter quarters in the low country called the rain forest, the trek to the summer feeding ground in the high country, and the placid summer existence of the herd, which culminates in the September mating season. Shows the attempts of the bulls to assemble harems and the resulting battles between the males.	Gr. 4 - ** Gr. 7 - **	
16. Wonders in the Desert ** Churchill-Wexler, 1960; 10 min., color Joan and Jimmy, elementary grade pupils, discover many forms of animal life existing in the desert. During a walk they see jack rabbits and burros, and examine closely an ordinary lizard, a horned toad, a chuckwalla, a desert tortoise, and a pocket mouse. The narrator points out how these animals gain protection and adapt themselves to desert life.	K - ** Gr. 4 - **	

* Good
** Excellent

II. Living Things - A. (continued)

Name and Description of Film	Other Grade Placements	Remarks
17. Wonders In Your Own Backyard ** Churchill-Wexler, 1949; 10 min., color A boy and girl find in their urban backyard an earthworm, a millepede, a sow bug, a pill-bug, a house spider and a snail. Close-up views show details as to how they move and eat.	K - ** Gr. 4 - **	

* Good
** Excellent

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SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

II. Living Things

A. Animal behavior

Name and Description of Film	Other Grade Placements	Remarks
Insects in the Garden ** EBF (Basic Life Science) 1965; 11 min., color Examines the role of insects in the world of living things. Observes, as an example, the insects on a rosebush -- aphids, ants, a green lacewing, and a ladybird beetle. Illustrates important stages in the life cycles of several insects. Shows how insects depend on each other and on plants for survival.	Gr. 4 -	No eval. yet
Looking at Birds ** EBF (Basic Life Science) 1964; 10 min., color Illustrates some of the ways in which birds differ from other animals -- in appearance, body structure and functions, and behavior. Shows some of the special ways in which birds are adapted to the environments in which they live.	Gr. K - **	

* Good
** Excellent
5-9-67

II. Living Things

B. Animals have young

Name and Description of Film	Other Grade Placements	Remarks
1. Animal Homes ** Churchill-Wexler, 1960; 11 min., color Shows a variety of animals making and using their homes for shelter, safety, food storage, and raising of young. Includes various birds, ants, a spider, gallfly, mole, gopher, oppossums, and coati.	Gr. 4 - **	Also listed II-A
2. Animals Growing Up ** EBF, 1949; 11 min., black & white Shows stages in the growth and development of puppies, a new-born calf, and baby chicks during the first few weeks of life. Illustrates how mother animals care for their young.		
3. Animals in Spring ** EBF, 1954; 11 min. Presents the activities of a variety of animals in the spring. Includes scenes which show the turtle emerging from the bottom of the pond to the surface of the water, fish swimming to a shallow creek to spawn, birds building nests, and the luna moth emerging from the cocoon. Shows how different animals protect their young from enemies.	Gr. 4 - **	

* Good
** Excellent

II. Living Things - B. (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. The Big Green Caterpillar ** Stanton Films, 1961; 11 min., color On an ordinary street there is a tree. On the tree there is a tiny insect egg. A boy finds the egg and raises the caterpillar that hatches out of the egg into an adult insect. The boy wonders how his pet grew so big in such a short time, eating only tree leaves. He wonders if chemicals in its body changed tree leaves into good food.	Gr. 1 - ** Gr. 5 - ** Gr. 7 - *	
5. Bird in Your Backyard ** Arthur Barr Prod., 1950; 11 min., color Two brothers share the fun and responsibility of a project to attract birds to their backyard. They make a feeding tray and observe the birds that come to feed; clean and refill a bird bath and learn the drinking and bathing habits of the bird visitors; discover a towhee nest, watch the eggs hatch, observe the parent birds care for their babies, and later see the young birds leave the nest.	Gr. 3 - ** Gr. 5 - ** Gr. 7 - **	
6. Birds of the Dooryard ** Coronet, 1954; 11 min. Presents birds which build their nests in gardens and near homes--robins, yellow warblers, eastern phoebes, yellow-shafted flickers, cardinals, swallows, house wrens, and purple martins. Describes the differences among these birds, their ways of protecting their nests and feeding their young, and ways in which they can be encouraged to nest around houses.	K - ** Gr. 3 - ** Gr. 5 - ** Gr. 7 - **	Adv. vocab.

* Good
** Excellent

II. Living Things - B. (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Black Bear Twins ** EBF, 1939; 11 min., black & white Portrays the habits and characteristics of bears by following a day's adventures of two cubs. Shows the cubs searching for food, frolicking in the forest, raiding a wild bee hive, and later nursing their stings in a mud puddle. Describes their experiences as they invade a nearby camp, breakfast on bacon and jam, and tangle with the camp equipment.		
8. The Bluebird * Heidenkamp, 1947; 10 min., color The Eastern bluebird, its life and habits. It locates its nest in holes in trees and posts, often in a hole made by a woodpecker. Shows nesting and brood activities, suitable home-made bluebird box, enemies such as starlings. Emphasizes value in eating harmful insects. Shows habits, habitat and characteristics of the bluebird; shows relationship to other birds, such as woodpecker and starlings.	Gr. 4 - **	
9. The Bobolink and Blue Jay ** Coronet, 1946; 11 min., color Shows the family life of the blue jay, who lavishes attention on his helpless young, and the bobolink who also is on the job when the youngsters get hungry.	Gr. 5 - ** Gr. 7 - **	Mature

* Good
** Excellent

II. Living Things - B. (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. Farmyard Babies ** Coronet, 1952; 11 min. First and second grade teachers use posters and models of farm buildings as an introduction to a study of farm life. Pictures of a farm in spring show a variety of young animals and portray their characteristics, habits, and eventual usefulness to the farmer.	K - ** Gr. 4 - **	
11. Five Colorful Birds ** Coronet, 1944; 11 min., color Presents five of America's most colorful birds--the goldfinch, cedar waxwing, yellow-headed blackbird, redheaded woodpecker, and bluebird--in their natural habitat, feeding, nesting, and rearing their young.	Gr. 4 - * Gr. 7 - *	
12. Fluffy, the Ostrich: Background for Reading and Expression ** Coronet, 1956; 11 min. A story about the adventures of a newly-hatched ostrich who wanders away from his family. Describes the physical characteristics and habits of ostriches.		
13. Gray Squirrel ** EBF, 1961; 10 min., black & white Presents the story of three young squirrels and their mother. Follows the growth and daily activities of the young squirrels from spring to midwinter. Shows the mother feeding and caring for her young, and the young squirrels learning to climb, to hunt for food, and to take care of themselves.	Gr. 5 - **	

* Good
** Excellent

II. Living Things - B. (continued)

Name and Description of Film	Other Grade Placements	Remarks
14. Life in an Aquarium ** Leonard Peck Prod., 1950; 11 min., black & white Elementary school children study an aquarium in order to learn how animals breathe and move about under water and how the tadpole develops into a frog.	Gr. 4 - ** Gr. 7 - **	Also listed II-A
15. Mother Deer and Her Twins ** EBF, 1960; 11 min., color In springtime, the season of rebirth and new birth, many baby animals can be found in the forest. Here is the story of twin fawns, Fleet and Shy, from the ages of two days to nearly a year. Children learn how mother deer cares for her babies, how she protects them from danger, and how the fawns learn to care for themselves.	Gr. 4 - **	
16. Poultry on the Farm ** EBF, 1960; 11 min., color Explains how different kinds of poultry live on a typical small farm. Shows chickens, geese, ducks, and turkeys at different ages in their natural environment. Follows the development of a chick embryo and the hatching of a chick. Includes review questions.	K - ** Gr. 5 - **	
17. Rikki, the Baby Monkey ** EBF, 1949; 11 min., black & white Shows the life of a baby Rhesus monkey in five sequences; Rikki and his family, Rikki has breakfast, Rikki finds a playmate, Rikki has an adventure, Rikki returns home.	K - **	

* Good
** Excellent

Living Things - B. (continued)

Name and Description of Film	Other Grade Placements	Remarks
18. The Robin * Heidenkamp, 1946; 10 min., color Depicts the life story of the robin from the time it arrives in the North in early spring. Shows nest building, eggs in the nest, feeding and care of the young, preening of feathers, etc.	K - ** Gr. 3 - * Gr. 5 - **	Diff. vocab. Must do own narration
19. Robin Redbreast ** EBF, 1938; 11 min., black & white Shows the characteristics and habits of a robin family, following Father and Mother Robin as they build the nest and share the duty of incubating the eggs. Portrays the development of the young robins from the time of hatching until they are able to leave the nest and care for themselves.		
20. Three Little Kittens ** EBF, 1938; 11 min., black & white Presents a study of the characteristics and habits of cats and kittens. Traces the development and early experiences of three kittens from birth until they are taken from their mother. Depicts the mother as she cares for her babies, and follows the growth of the kittens as they play, climb, eat, and learn to care for themselves.		

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

Additions to
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II. Living Things

B. Animals have young

Name and Description of Film	Other Grade Placements	Remarks
Animals In Summer ** EBF, 1953, 11 min., color Shows more than a dozen common animals of the woods, varying from fish to insects and meat eaters. The animals are seen seeking food and sheltering their young from enemies.	Gr. 1 - ** Gr. 4 - ** Gr. 5 - ** Gr. 7 - **	
Insects: How to Recognize Them ** Coronet, 1964; 11 min., color Presents ways to recognize insects. Shows that insects have three body parts, three pair of jointed legs and two antenna. Depicts that they undergo changes as they grow up. Reveals clues in recognizing different groups of insects such as beetles, flies, butterflies and moths.	Gr. 1 - **	
The Red Hen BAR, 1963; 11 min., color Tells the story of a red hen who leaves the other chickens and secretly goes to a nest under a hedge, where she has hidden many eggs. Shows the hen watching the baby chicks after three weeks of sitting, teaching them to drink, to scratch for food, enjoying a dust bath. Concludes by showing the hen leading the chicks back to her own yard.	Gr. K - **	No eval. yet

* Good
** Excellent
4-28-67

Living Things - B. (continued)

Name and Description of Film	Other Grade Placements	Remarks
21. Wood Duck Ways * U of M, 1956; 20 min., color Follows the wood duck from the courting and mating season in the early spring, through the incubation and hatching periods and the brood's emergence from its tree home. Shows three broods actually leaving their nests and landing on the ground. Depicts the brood as it feeds and grows to maturity, and makes suggestions on how to construct and place nesting houses.	Gr. 5 - ** Gr. 7 - **	Diff. vocab.

* Good
** Excellent

II. Living Things

C. How plants live and grow

Name and Description of Film	Other Grade Placements	Remarks
1. Learning About Leaves ** EBF, 1958; 11 min. With time- lapse photography, animation, and close-ups, explains how leaves are important to plants, animals, and man; compares different kinds of leaves; shows how leaves are related to other parts of a plant; and illustrates the functions of green leaves, and the changes that take place during the different seasons.	Gr. 2 - Gr. 5 - **	Also listed II-D
2. Fall Brings Changes ** Churchill-Wexler, 1962; 11 min., color This film shows the adaptation of plants and animals to colder weather. Useful in the area of Language Arts. It is beautiful and poetic and will inspire many stories to enrich the child's imagination and vocabulary.	K - ** Gr. 1 - ** Gr. 4 - **	Also listed II-A
3. How Does a Garden Grow? ** 11 min., color, $120; b/w, $60. Film Associates of California This colorful film interprets the cycle of seed to flower to seed for the young scientist. A small boy plants some flower seeds. Day by day he cares for his garden. He waters the ground and watches and waits. Through the use of time-lapse photography, the student sees the seeds send their roots down deep into the soil while their young shoots grow up toward the sun. As time passes, the boy is rewarded with beautiful, bright colored flowers. At summer's end the flowers die--to leave behind seeds that may be planted once again the following spring.		

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

Additions to
Page 19

II. Living Things

C. How plants live and grow

Name and Description of Film	Other Grade Placements	Remarks
Living Things are Everywhere ** EBF (Basic Life Science) 1964; 11 min., color There are many different kinds of living things. Some are animals and some are plants. Some are large and some are so small that they are difficult to see. Wherever you are, you can find living things if you look very closely. You can find them in water, in the air, on the ground, and underground. Living things move about in different ways. Some can run or crawl on the ground; some can climb trees; some can swim; and some can fly. All plants and animals must live in places where they can get the kind of food they need.	Gr. K - ** Gr. 1 - **	

* Good
** Excellent
5-9-67

II. Living Things - C. (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Spring Brings Changes ** Churchill-Wexler, 1962; 11 min., color In spring, when the sun warms the earth, and the world comes alive, farmers plow their fields and Faith and Mark plant a vegetable garden. Beautiful nature photography compresses in time a wealth of changes in plants and animals, changes that occur so gradually that they are difficult for the child to grasp.	K - ** Gr. 4 - **	
5. What Plants Need For Growth ** EBF, 1960; 10 min., color Uses time-lapse photography to indicate by means of simple demonstrations the factors required for plant growth, including water, light, minerals, air and warmth. Time-lapse photography is used to compare plant growth under favorable and unfavorable circumstances.	K - ** Gr. 4 - *	
6. Wonders of Plant Growth ** Churchill-Wexler, 1960; 10 min., color A girl and boy experiment with plants. They grow plants from a bean and a squash seed, the stem of a geranium, the leaf of a succulent, and the root of a sweet potato plant. Growth is shown in time-lapse photography. Other experiments with plants which children can perform are indicated.	Gr. 3 - ** Gr. 5 - **	

* Good
** Excellent

II. Living Things

D. Understanding ourselves

Name and Description of Film	Other Grade Placements	Remarks
1. Apples, from Seedlings to Market ** EBF, 1950; 11 min., color Uses the "Delicious" apple as an example to trace the major steps of apple growing and packing, from planting and grafting stages through shipment of the packaged fruit. Filmed in the Wenatchee Valley in Washington.	Gr. 4 - ** Gr. 7 - **	
2. Autumn on the Farm ** EBF, 1948; 11 min., color Activities on the farm and in the neighboring woods in September, October and November. Joan and Jerry pick apples and pumpkins, hunt for nuts, and watch the wild animals and birds. Father prepares silage and Mother picks grapes for jam and jelly.	Gr. 4 - *	
3. Farm Animals ** EBF, 1937; 11 min., black & white Follows Farmer Brown in typical daily activities as he cares for his cows, horses, pigs, sheep and goats. Shows him feeding and milking his cows, working with his horses in the fields, feeding his pigs and shearing his sheep. Includes scenes of newborn calves, colts, lambs, and kids. Reproduces sounds of all the animals depicted.	K - ** Gr. 4 - **	Easy film

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

Additions to
Page 21

II. Living Things

D. Understanding ourselves

Name and Description of Film	Other Grade Placements	Remarks
How Animals Help Us ** Coronet; 1954; 10 min., color Illustrates how animals help man to secure the necessities of life, including food, clothing, and labor in producing other things. Pictures various helpful animals on a farm including cows, horses, turkeys, chickens, minks, and a dog, and tells of the ways in which they are helpful to man. Uses the theme of a boy who tries to find a useful job on the farm for a kitten which he wants to keep as a pet.	Gr. 3 - ** Gr. 4 - **	

* Good
** Excellent
5-9-67

II. Living Things - D. (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Food From Our Garden ** EBF, 1952; 10 min., color Shows the members of a family working in their garden. Describes the structure and growth of plants; examines the plants of several common vegetables, pointing out in each the location of the edible portion and its function in the growth of the plant.	Gr. 1 - ** Gr. 4 - ** Gr. 7 - **	
5. How Plants Help Us ** McGraw-Hill, 1960; 12 min., color Illustrates that plants are useful to man in many ways. Shows plants as a source of lumber, paper, rubber, clothing, and food. Shows the parts of a plant which are useful as food, including leaves, stems, roots, seeds, and seed pods, and pictures sequences which show how cotton is made into cloth and wheat into bread.	Gr. 4 - **	
6. Learning About Leaves ** EBF, 1958; 11 min. With time-lapse photography, animation, and close-ups, explains how leaves are important to plants, animals, and man; compares different kinds of leaves; shows how leaves are related to other parts of a plant; and illustrates the functions of green leaves, and the changes that take place during the different seasons.	Gr. 2- Gr. 5 - **	Also listed II-C

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

Additions to
Page 23

III. Energy

A. How sounds travel

Name and Description of Film	Other Grade Placements	Remarks
Sound and How It Travels ** EBF (Basic Physical Science) 1963; 11 min., color Young vacationers learn what causes sound, why we are able to hear it and what determines its pitch. They hear the many sounds at the beach -- a seagull's cry, an oyster boat's horn, the lapping of waves against the pier, the murmur within a seashell. A freighter blows its whistle, yet it can not be heard until waves of sound vibrations travel to their ears. They discover that sounds travel underwater, through wood, and along a guitar string -- its pitch varying as the string is lengthened and shortened. They learn that like a drum top, eardrums vibrate to sounds and the funnel shape of the outer ear helps to gather sounds from the world around them.	Gr. 6 - **	

* Good
** Excellent
5-9-67

III. Energy

A. How sounds travel

Name and Description of Film	Other Grade Placements	Remarks
1. Learning About Sound ** EBF, 1958; 8 min., black & white Develops the concept of sound and discusses its generation and transmission. Shows how the vibration of a string produces sound. Uses animation to depict air vibration, illustrates the vibration of a drum head by using iron filings and the concept of vibrating air columns in the example of a willow whistle. Portrays sound graphically through the use of an oscilloscope. Demonstrates the transmission of sound through air, water, and metal and ends with a review of concepts and questions.	Gr. 6 - * Gr. 9 - *	

* Good
** Excellent

III. Energy

C. Magnets and what they do

Name and Description of Film	Other Grade Placements	Remarks
1. Magnets ** Young America, 1946; 13 min., black & white Two children learn about the nature and behavior of temporary and permanent magnets. Shows that like poles repel and unlike poles attract each other, that a suspended bar magnet acts as a compass needle, that a plain bar of steel can be magnetized and made into a bar magnet, and that the magnetic force of a magnet will go through such things as glass and paper.	Gr. 4 - **	

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

II. Energy

B. Light and how it is reflected

Name and Description of Film	Other Grade Placements	Remarks
Light and What it Does EBF; 1962; 11 min., color Demonstrates through a series of simple problem-solving experiences, how light travels; how it is affected by different materials; what causes reflection and refraction; and how light is used in many every day activities. We see boys experimenting with a camera and light meter. They perform experiments which demonstrate reflection and refraction; with mirrors and other shiny surfaces and by observing that a thermometer in a tank of water appears to be bent or broken. They learn that magnifying glasses and telescopes bend light to make what we see look larger and far away things seem nearer.	Gr. 6 -	No eval. yet No eval. yet
Your Eyes ** EBF (Basic Life Science) 1964; 7 min., color Sometimes it takes a game like Blind Man's Bluff to make us realize how much we depend upon our eyes. Children in this film demonstrate ways in which we depend on our eyes. Simple animation shows how this delicate instrument, the eye, works. The film concludes by showing ways in which we can take good care of our eyes.	Gr. 5 *	

* Good
** Excellent
5-9-67

Additions to
Page 25

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

III. Energy

D. Things that help and hinder work

Name and Description of Film	Other Grade Placements	Remarks
Making Work Easier EBF (Basic Physical Science) 1963; 11 min., color Watching men at work on a housing project, a young boy discovers that many objects in everyday use are simple machines which help to make work easier. The bricklayer rolling his wheelbarrow up the ramp is using an inclined plane; the carpenter turning a screw into the wall is using a spiral inclined plane; the workman chopping a log with his axe is using a wedge, as is his helper, who is hammering a nail into a board. A large board being used to move sewer pipe is a lever. The boy discovers that a pop bottle opener is a lever also. A pulley is used to pull a bucket of cement up to the scaffolding. Complicated machines (steamshovels, tractors) are shown to be combinations of simple machines.	Gr. 6 - **	No eval. yet
Simple Machines -- Lever Family EBF; 1963; 14 min., color Uses demonstrations and animated diagrams to explain the operating principles of the basic machines in the lever family. Shows how the lever, pulley, wheel, and axle are related to each other, and how each makes work easier.	Gr. 6 -	No eval. yet No eval. yet

* Good
** Excellent
5-9-67

III. Energy

D. Things that help and hinder work

Name and Description of Film	Other Grade Placements	Remarks
1. Simple Machines: Inclined Planes **	Gr. 6 - ** Gr. 9 - **	
Coronet, 1954; 6 min., black & white	Gr. 11 -	No eval. yet
Shows how an inclined plane or slope facilitates the moving of heavy objects. Demonstrates the everyday use of the inclined plane and explains that such simple machines as screws and wedges are used when it is desirable to trade distance for force.		

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two
(Addendum)

Additions to
Page 27

IV. The Universe

A. What we see in the sky

Name and Description of Film	Other Grade Placements	Remarks
Big Sun and Our Earth ** Coronet; 1957; 10 min., color Presents some of the fundamental concepts regarding the sun. Introduces rotation of the earth and it's relationship to the sun, day and night as resulting from the earth's rotation, the distance of the earth from the sun, and the effects of the sun's heat and light upon the earth. Follows the apparent movement of the sun across the sky. Observes -- length of shadows, movement of a flower in the direction of the sun, opening and closing of flower petals, intensities of sunlight.	Gr. 1 - **	
Space Flight Around the Earth ** Churchill; 1963; 10 min., color Shows pre-launch preparations, the launching, the space flight, and return to earth of a space capsule. Pictures the astronaut, John Glenn, as he dresses in his space suit and enters the capsule on top of a rocket. Depicts the complexity of equipment needed to launch and control rockets and space ships. Pictures views of the earth as seen by the astronaut while he circles the globe in a 100 mile high orbit. Shows re-entry, parachute opening, and safe landing.		

* Good
** Excellent
5-9-67

IV. The Universe

A. What we see in the sky

Name and Description of Film	Other Grade Placements	Remarks
1. The Sky Int'l Film Bureau; 10 min., color This film deals with objects in the sky most of which are familiar to children. It begins with the sun, our dependence upon it, the shadows it causes, and the fact that it seems to pass across the sky. Clouds, their formation, and their interference with our vision of the sun, are also discussed. Considerable attention is given to the color of the sky with possible explanations for this color. Winds and the effects of winds are vividly shown. The moon and the stars are also mentioned.	Gr. 3 - **	No eval. yet

* Good
** Excellent

IV. The Universe

B. Movements of the earth

Name and Description of Film	Other Grade Placements	Remarks
1. Gravity - How It Affects Us ** EBF, 1960; 14 min., black & white Illustrates gravity's importance by showing some of the things that gravity does; its action upon our daily activities, its effects on our earth, and how it would affect a human being on an imaginary trip through outer space. Includes sequences on the experiments of Galileo and Isaac Newton.	Gr. 3 - ** Gr. 6 - ** Gr. 9 - **	A little adv. Difficult
2. Shadows on our Turning Earth ** 10 min., color, $120; b/w, $60 Film Associates of California Shadows are made when objects block light. The surface of the earth, on the side away from the sun, is always in shadow. The movement of the earth, as it turns continuously into and out of its own shadow, produces day and night.		
3. What Makes Day and Night ** Young America, 1947; 8 min., black & white Two children learn that the alternation of day and night is due to the rotation of the earth and not to the apparent movement of the sun around the earth.	Gr. 5 - *	

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Two

(Deletions)

No. and Name of Film	Page No.	Reason
II. Living Things		
B. Animals have young		
18. The Robin	16	Removed from circulation by AV Dept.

5-9-67

For discussion purposes only

SCIENCE FILMSTRIPS

for
Grade Two

Correlated to the Unit Titles as found in the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department

For discussion purposes only

Grade Two

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The annotations for filmstrips on the following pages were obtained from sources such as the Wilson's Filmstrip Guide, producers' catalogs, and the Library of Congress cards.

I. The Earth

Water appears and disappears

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. How Does Water Get Into the Air? ** Jam Handy Organization, 1955; 27 fr., color (First Experiments About Weather Series, 6 f.s.), $4.75 each Art work illustrations. Johnny wonders where water comes from and how it gets up in the sky. Simple experiments show how water changes into water vapor and evaporates.	K. - ** Gr. 2 - ** Gr. 3 - * Gr. 5 - *	Excellent For slow groups or review
2. What Makes Things Dry Faster? ** Jam Handy Organization, 1955; 26 fr., color (First Experiments About Weather Series, 6 f.s.), $4.75 each Art work illustrations. Jane wishes she could make her painting dry faster. Through experiments, she learns that warm air and moving air make things dry faster.	Gr. 3 - ** Gr. 5 - **	
3. Where Do Clouds Come From? ** Jam Handy Organization, 1955; 23 fr., color (First Experiments About Weather Series, 6 f.s.), $4.75 each Art work illustrations. Betty wonders where clouds come from and where they go. She performs a series of experiments which show her what causes clouds to form in the sky.	Gr. 3 - **	

* Good
** Excellent

SCIENCE FILMSTRIPS

Addendum

Grade Two

II. Living Things

A. Animal behavior

Birds In Spring **

Jam Handy; 21 fr., color

(Spring Comes! series) 1958
5 filmstrips, $5.75 ea., $26.25 set

Explains that the migratory birds return to tell in song that spring has come; shows how the birds search for food and how and where they build their nests; and describes how after the baby birds are hatched, they are fed and cared for by their parents.

* Good
** Excellent

4-1-67

SCIENCE FILMSTRIPS
Addendum

Grade Two

Addition to Page 3

II. Living Things

B. Animals have young

Animals In Spring **

Jam Handy; 21 fr., color

(Spring Comes! series) 1958
5 filmstrips, $5.75 ea., $26.25 set

Hibernating animals awaken in the spring. Shows how they search for food and how they change their coats. Shows the feeding care, and antics of young animals in the spring.

Birds In Spring **

Jam Handy; 21 fr., color

(Spring Comes! series) 1958
5 filmstrips, $5.75 ea., $26.25 set

Explains that the migratory birds return to tell in song that spring has come; shows how the birds search for food and how and where they build their nests; and describes how after the baby birds are hatched, they are fed and cared for by their parents.

Butterflies Grow **

Jam Handy; 25 fr., color

(Growing Things Series) 1953
7 filmstrips, $5.75 ea., $36.75 set

Dick finds a caterpillar on a milkweed and watch it eat and grow. They see it change from a caterpillar to a chrysalis and then to a beautiful Monarch butterfly.

* Good
** Excellent

4-1-67

SCIENCE FILMSTRIPS
Addendum

II. Living Things - B. (continued)

Insects In Spring **

Jam Handy; 21 fr., color

(Spring Comes! series) 1958
5 filmstrips, $5.75 ea., $26.25 set

Explains that the appearance of the mourning cloak is a first sign that the insect world is stirring in spring. The doors to the cocoons, anthills and beehives open. Eggs hatch, grubs develop into adults.

People In Spring **

Jam Handy; 21 fr., color

(Spring Comes! series) 1958
5 filmstrips, $5.75 ea., $26.25 set

Shows activities in spring. Parents put up screens, paint and work in the garden. Children enjoy the warmer weather and longer days in which to skate, play ball and help around the home.

Toads Grow **

Jam Handy; 25 fr., color

(Growing Things Series) 1953
7 filmstrips, $5.75 ea., $36.75 set

Jack finds a string of toad eggs in a pond. He takes them to school where the children discover how the eggs change to tadpoles and then to helpful toads.

* Good
** Excellent

4-1-67

II. Living Things

B. Animals have young

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Life Story of a Butterfly ** Moody [illegible]stitute of Science, 1959, 39 fr., color [illegible]g Things Series, 4 f.s.), $6.00 each From the tiny egg to the fully grown butterfly the complete life cycle of the Anise Swallowtail Butterfly is shown in detailed photographs.		Little difficult to understand
2. Looking At Birds ** Row-Peterson Textfilms, 1958, 43 fr., color (Basic Science Education Series-Bird Study Group, 5 f.s.), $6.00 each Some birds are very large; some are very small. They live all over the world. Specificity of diet is discussed. It calls attention to the walk of some birds and the hop of others. The stages in growing up for a robin family are shown. Different bird homes are shown as well as differing structural adaptation.		

* Good
** Excellent

II. Living Things

C. How plants live and grow

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. How Does a Garden Grow? ** Moody Institute of Science, 1959, color (Living Things Series, 4 f.s.), $6.00 each All living things depend upon green plants Because plants are so important to us we should know about the sprouting of seeds, primary and secondary roots, and the vital need for light and water.		
2. Flowers, Fruits, Seeds ** Row-Peterson Textfilms, 1956; 44 fr., color (Plant Study Group, 4 f.s.), $6.00 each, $21.50 set. The fruits and seeds of a flowering plant come from its flowers. Complete flowers have sepals, petals, stamens, pistils. Stamen produce pollen. Pistils contain ovules. Only ovules can grow into seed. Pollen may be carried from stamen to pistil several ways. A seed is made up of a baby plant and a seed coat. Fruits are packages of seeds. Many flowers, fruits, and seeds furnish us with food. There are many families of flowering plants.		
3. Green Plants Are Important to Us ** Jam Handy Organization, 1964; 27 fr., color (Plants Around Us, 6 f.s.) $5.75 each, $31.50 set Demonstrates that directly or indirectly, green plants provide either sustenance, or at least the material for sustenance, for human beings. This may be as food or, as illustrated in the filmstrip, wood which we then use in building houses. There are other examples of this concept.	Gr. 4 - **	

* Good
** Excellent

II. Living Things - C. (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. How Green Plants Grow * Jam Handy Organization, 1964; 24 fr., color (Plants Around Us, 6 f.s.), $5.75 each, $31.50 set Describes the generally common process of plant growth and how this growth takes place.	Gr. 5 - *	Difficult
5. New Plants From Older Plants ** Jam Handy Organization, 1964; 29 fr., color (Plants Around Us, 6 f.s.), $5.75 each, $31.50 set Plants can be grown in other ways than by seed germination. Example is given of making plant cuttings to show how new plants can grow by properly cutting and planting the cuttings of older plants.	Gr. 1 - **	
6. What Do Green Plants Need For Growth ** Jam Handy Organization, 1964; 33 fr., color (Plants Around Us, 6 f.s.), $5.75 each, $31.50 set Showing that most green plants need a common number of factors basic to them all, but principally heat, light, water, air and certain nutrients, for successful growth.		
7. Where Green Plants Grow ** Jam Handy Organization, 1964; 31 fr., color (Plants Around Us, 6 f.s.) $5.75 each, $31.50 set To provide the student with an understanding that plants can and do exist and grow in a variety of environments.		

* Good
** Excellent

SCIENCE FILMSTRIPS

Addendum

Grade Two

II. Living Things

C. How Plants Live and Grow

Plants Grow **

Jam Handy; 25 fr., color

(Growing Things Series) 1950
7 filmstrips, $5.75 ea., $36.75 set

Jane plants some seeds from a jack-o-lantern. She watches the tiny plants grow and develop flowers and fruit. In autumn she takes a big orange pumpkin to school for a jack-o-lantern.

Plants In Spring **

Jam Handy; 21 fr., color

(Spring Comes! Series) 1958
5 filmstrips, $5.75 ea., $26.25 set

Spring brings the return of nature's beauty and color as plants begin to bloom. Shows how crocuses, violets, tulips and other plants grow in the proper spring mixture of soil, sun and water.

Trees Grow *

Jam Handy; 25 fr., color

(Growing Things Series) 1950
7 filmstrips, $5.75 ea., $36.75 set

In early spring, the children watch the planting of a maple tree in the school yard. They observe its buds, flowers, seeds and new leaves. The tree serves as a home for a robin and furnishes shade for playtime. In autumn, its colorful leaves are a source of beauty.

* Good
** Excellent
4-1-67

III. Energy

C. Magnets and what they do

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Different Kinds of Magnets * Jam Handy Organization, 1960; 29 fr., color (Magnets Series, 6 f.s.), $5.75 each Through experimentation and observation, the class learns why magnets are made in different sizes and shapes. They discover that the poles are where the magnetic force of attraction is greatest.	Gr. 4 - **	
2. Discovering Magnets * Jam Handy Organization, 1960; 30 fr., color (Magnets Series, 6 f.s.) $5.75 each While helping his father, a boy discovers that a magnet helps them to do work. He experiments to find that the magnet will attract some objects but not others.	Gr. 4 - **	
3. Magnetic Fields ** Jam Handy Organization, 1960; 40 fr., color (Magnets Series, 6 f.s.), $5.75 each Students see a short history of magnets leading to their use in compasses. They observe how poles repel and attract each other. Through experimentation, they learn about lines of force and the earth's magnetic field.	Gr. 4 - * Gr. 3 - **	
4. Magnets Can Attract Through Objects * Jam Handy Organization, 1960; 32 fr., color (Magnets Series, 6 f.s.), $5.75 each Two children find that a magnet will attract iron and steel through glass, wood and other materials. They see how a magnet has a variety of uses in the home.	Gr. 4 - * Gr. 9 - *	

* Good
** Excellent

III. Energy - C. (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
5. Magnets Help to Find Direction ** Jam Handy Organization, 1960, 26 fr., color (Magnets Series, 6 f.s.), $5.75 each The class sees how a compass helps to find direction. They find that the compass needle is a magnet and learn to make a variety of compasses from other magnets.	Gr. 3 - ** Gr. 4 - **	

* Good
** Excellent

III. Energy

D. Things that help and hinder work

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Levers ** Jam Handy Organization, 1958; 18 fr., color (Simple Machines Help Us Work Series, 6 f.s.), $5.75 each, $31.50 set Defines the machine and shows examples of familiar machines. Introduces the first simple machine--the lever. A simple experiment and examples of the seesaw, bottle opener and claw hammer display how levers help in the work of lifting and prying.		
2. Ramps ** Jam Handy Organization, 1958; 18 fr., color (Simple Machines Help Us Work Series, 6 f.s.), $5.75 each, set $31.50 Describes the function of the ramp; the role of this machine in the city and on the farm.		
3. Screws * Jam Handy Organization, 1958; 22 fr., color (Simple Machines Help Us Work, 6 f.s.), $5.75 each, $31.50 set Everyday situations showing how the screw helps in changing an automobile tire, in canning and in repairing a wagon clearly demonstrate the function of this simple machine.		

* Good
** Excellent

III. Energy - D. (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

4. Wedges **

Jam Handy Organization, 1958; 21 fr., color (Simple Machines Help Us Work, 6 f.s.), $5.75 each, $31.50 set

This filmstrip colorfully unfolds the part the wedge plays in doing work. The axe, knife and bulldozer distinctly show how each utilizes the wedge.

5. Wheels and Axles *

Jam Handy Organization, 1958; 17 fr., color (Simple Machines Help Us Work, 6 f.s.), $5.75 each, $31.50 set

The function of the wheel and axle is graphically portrayed in this filmstrip. A visualized experiment and illustrations of commonplace objects show children how this machine helps to do work. Some of the objects are a steering wheel, door knob and pencil sharpener.

* Good
** Excellent

SCIENCE FILMSTRIPS

Addendum

Grade Two

IV. The Universe

B. Movements of the earth

Our Earth In Motion *

Jam Handy; 39 fr., color

(Seasons, Weather & Climate) 1952
5 filmstrips, $5.95 ea., $29.00 set

Facts concerning the earth in motion; its rotation, revolution, tilt, effects of gravity, time.

The Sun And Our Seasons **

Jam Handy; 39 fr., color

(Seasons, Weather & Climate) 1952
5 filmstrips, $5.95 ea., $29.00 set

How hemispheres tipping toward or away from sun causes seasons, length of days and nights. How temperatures of seasons are caused by length of days, directness of sun's rays, amount of air through which rays pass.

* Good
** Excellent

4-1-67

15.35

Unit Price

BASIC SCIENCE SUPPLIES FOR ELEMENTARY SCHOOLS February 1966

Item No.		Unit	Unit Price
32-0140	ALCOHOL, Denatured	quart	.34
17-0100	ALUMINUM FOIL, 15" x 50', to waterproof table tops	roll	.62
17-0110	ALUMINUM FOIL, 18" x 50', for use under an aquarium or terrarium	roll	1.03
28-0100	ANIMAL PEN, 18" x 24" x 18" high	each	6.61
28-0105	ANIMAL PEN, cage, 9" x 9" circular	each	4.55
28-0110	ANT HOME, Turtox 220A167	each	7.50
	AQUARIUMS, TERRARIUMS AND SUPPLIES:		
28-0030	ACID NEUTRALIZER	ounce	.45
28-0040	AERATOR, Saxon	each	6.00
28-0200	AQUARIUM, 3 gallon, seamless	each	6.34
28-0300	AQUARIUM, 6 gallon	each	9.07
28-0340	AQUARIUM CEMENT	lb.	.60
	AQUARIUM COVER (include pattern w/requisition)		
28-0390	9-7/8" x 5-3/4", clear plexiglass	each	.42
28-0400	9-7/8" x 5-3/4", glass, double strength	each	1.00
28-0490	9-1/2" x 17-1/2", clear plexiglass	each	1.27
28-0500	9-1/2" x 17-1/2", glass, double strength	each	1.23
28-0600	AQUARIUM AND TERRARIUM SEALER	tube	.30
28-2100	CHARCOAL, Chunk 5#	bag	.43
28-3000	DIP NET, 3" wide, 3-1/2" deep	each	.35
28-3020	DIP TUBE, plastic, 16", no scraper attachment	each	.90
28-3025	AQUARIUM METAL SCRAPER, long handle	each	.60
28-3290	FEEDING RING, 2"	each	.20
47-3260	GLASS SCRAPER, all metal	each	.18
47-0340	BLADES for above scraper	each	.02
28-4160	GRANITE CHIPS	lb.	.034
28-4180	GRAVEL	lb.	.05
28-7460	SAND	lb.	.15
28-8100	SOIL, sterile	bushel	1.50
28-9320	TEMPERATURE CONTROL OUTFIT: Thermostat #340 to include one of the following:	each	5.85
28-4310	PENCIL HEATER, 25 w, for aquarium, 1 to 3 gallon	each	2.00
28-4320	PENCIL HEATER, 50 w, for aquarium, 4 to 6 gallon	each	2.00
28-4330	PENCIL HEATER, 75 w, for aquarium, 7 to 15 gallon	each	2.75
28-0700	ASPIRATOR, Chapman pump, Cenco 13205-3, w/adapters to connect to sink	each	3.25
28-0705	HOSE FOR ASPIRATOR, black (indicate footage needed)	ft.	.27
28-0800	BALANCE, demonstration, clamp and support only (must order meter stick #28-5380 to complete set)	each	2.60

BASIC SCIENCE SUPPLIES FOR ELEMENTARY SCHOOLS

Item No.		Unit	Unit Price
28-2010	CALCIUM HYDROXIDE SOLUTION, limewater (Also see Lime Water Tablets #28-4810)	1# bottle	.60
28-2030	CANDLES, Paraffin	doz.	.48
28-2040	CASTER CUPS, glass	each	.10
28-2050	CAT'S SKIN, half	each	3.64
28-2060	CELL, student's demonstration	each	3.15
28-2110	CHIMNEY, lamp	each	1.00
28-2120	CLAMP, Burette	each	1.20
28-2140	CLAMP, pendulum	each	2.30
28-2160	CLIP, Fahnestock, to be used to mount electrical apparatus (10 in package)	pkg.	.17
28-2200	COMPASS, magnetic, 16 mm diameter	each	.25
28-2240	COMPASS, magnetic, about 45 mm diameter	each	.70
28-2300	COMPOUND BAR, bi-metal	each	.78
28-2400	CONDUCTOMETER, four 5" wires on handle, overall length 13 inches	each	2.05
28-2500	CORKS, assorted, xx quality, sizes 0-11 (100 in bag)	bag	1.35
28-2540	CORK BORER, set of 6, 1/2" largest borer	set	6.2[illegible]
28-2560	COTTON, absorbent, not sterilized	lb.	.90
28-2600	CULTURE DISHES, Petri, Pyrex, 100 mm x 15 mm	pair	.60
17-3380	CUPS, measuring, Set of 4 (1 C, 1/2 C, 1/3 C, 1/4 C)	set	.36
28-2700	CYLINDER, graduated, Tuttle, short form, 100 ml capacity	each	2.70
28-2720	CYLINDER, hydrometer jar, 275 ml capacity, 13-38" high	each	2.40
28-3015	DISHES, evaporating, Coors 430, 75 mm diameter, 30 mm high, 70 ml capacity	each	.47
28-3040	DISSECTING NEEDLE, wooden handle, bent needle	each	.10
28-3050	DISSECTING NEEDLE, wooden handle, straight needle	each	.07
28-3100	DROPPER, medicine, (12 to pkg)	pkg.	.46
28-3140	DROPPING BOTTLE, 30 ml	each	.35
59-0130	DRY CELL, 1½ volt, #6, diameter 2-1/2", height 6"	each	.64

BASIC SCIENCE SUPPLIES FOR ELEMENTARY SCHOOLS

Item No.		Unit	Unit Price
28-3200	ELECTRIC PLATE, 3 heat, 1000 watt, 110 volt	each	6.14
28-3240	ELECTROMAGNET, horseshoe type	each	11.40
28-3260	ELECTROSCOPE, flask form, 250 ml, Pyrex Erlenmeyer flask	each	2.85
28-3280	ETHYL ACETATE, for killing insects	lb.	1.26
28-3300	FEHLING'S SOLUTION, A	16 oz bottle	1.20
28-3320	FEHLING'S SOLUTION, B	16 oz bottle	1.55
28-3400	FILE, Triangular, 4"	each	.38
28-3500	FILTER PAPER, qualitative, 100 circles per package, 11 cm diameter	pkg.	.44
28-3600	FLASK, Erlenmeyer, narrow mouth, Pyrex, 250 ml	each	.48
28-3620	FLASK, Erlenmeyer, narrow mouth, Pyrex, 500 ml	each	.61
28-3800	FUNNEL, plastic, 73 mm, or 2-7/8" top diameter	each	1.14
28-4000	FUNNEL, Pyrex, 65 mm or 2-1/2" top diameter	each	.75
28-4100	FUNNEL, thistle top, 30 cm or 12" length, 35 mm or 1-1/4" diameter	each	.36
	GLOVES, rubber:		
28-4120	size 8	pair	.80
28-4130	size 9	pair	.80
28-4140	size 10	pair	.80
28-4200	GYROSCOPE, simple form, 5.5 cm diameter, support and starting cord	each	1.25
28-4360	HYDROCHLORIC ACID (HCL)	lb.	1.03
28-4400	HYGROMETER, Humidiguide, direct reading	each	9.00
28-4500	IRON FILINGS	1# carton	.38
28-4600	JAR, battery, cylindrical, 1 gallon	each	1.42
28-4800	LAMP, incandescent, miniature, 2-1/2 volt maximum, screw base	each	.25
28-4805	LENSES, demonstration set, 3.75 cm diameter, 6 in set	each	5.25
28-4810	LIME WATER TABLETS (See Calcium Hydroxide Solution, #28-2010)	each	.0075
28-4820	LITMUS PAPER, blue, 100 strips in vial	vial	.09
28-4840	LITMUS PAPER, neutral, 100 strips in vial	vial	.09
28-4860	LITMUS PAPER, red, 100 strips in vial	vial	.09

Item No.		Unit	Unit Price
28-4940	MAGNETS, bar, steel, 2 in box with keepers	set	1.80
28-5100	MAGNETS, ceramic cylinders, 3/8" x 1/8", #1054	each	.03
28-5000	MAGNETS, ceramic cylinders, .52" x .25", #866	each	.03
28-5140	MAGNETS, "floating"	each	3.25
28-5200	MAGNETS, horseshoe, 2.8 cm	each	.60
28-5240	MAGNETS, horseshoe, 4 cm	each	2.20
28-5250	MAGNETS, natural, lodestone	each	.22
28-5260	MAGNETIC NEEDLE, on stand	each	2.45
28-7100	MAGNIFIER, round, 3" diameter reading glass with handle, 2x to 3x	each	1.25
28-5300	MAGNIFIER, small, premium plastic, 3-5/8" long, fitted with two spherical convex lens (3x and 7x) and two cylindrical magnifiers	each	.31
28-5280	MAGNIFIER, tripod, 10x	each	1.10
28-5320	MAT, asbestos, 10" x 16"	each	.65
28-5340	MAT, wire gauze, asbestos center, 4 inch	each	.21
28-5380	METER STICK, maple, metric and English scales	each	.85
28-5400	MICROSCOPE, ELECTRIC, including: 50X and 100X objectives, 12 prepared slides, micromount cards, one 32 page booklet, "The Microscope in Elementary Science", and wood case	each	18.18
18-4600	ELECTRIC LIGHT BULB, 6 watt, 115 volt, candelabra bayonet base (replacement bulb for item #28-5400)	each	.18
28-5410	MICROSCOPE, model ESM, 100X Bausch and Lomb (No Sub) Cat. 31-33-03 (Price includes illuminator, item #28-5425)	each	15.00
28-5420	MICROSCOPE, ZOOMSCOPE, Model STZ 100 Bausch and Lomb (No Sub) Cat. 31-21-03 Magnification 25x through 100 x Zoom. (Price includes illuminator, item #28-5425)	each	53.00
28-5425	ILLUMINATOR, portable, Bausch and Lomb (No Sub) Cat. 31-33-03 Rite-Lite	each	3.00
28-5426	LAMP, replacement for microscope illuminator (Rite-Lite) Item #28-5425, 9-3/4 watt, candelabra, screw base, Bausch and Lomb, (No Sub) Cat. 31-31-40	each	.15
28-5500	MICROSCOPE SLIDES, culture	each	.12
28-5600	MICROSCOPE SLIDES, plain, 72 per box	box	1.10
28-5700	MIRROR, concave and convex, 75 cm diameter, 20 cm focus	each	1.00
28-5740	MIRROR, plane, square, 10 cm x 10 cm	each	.20
28-5800	MORTAR AND PESTLE, porcelain, Coors 522, 100 mm diameter, 60 mm high, 115 mm pestle length	set	1.66
28-5840	MOTOR, St. Louis, with 2 bar magnets; electromagnet attachment, $6.15	each	13.50

BASIC SCIENCE SUPPLIES FOR ELEMENTARY SCHOOLS

Item No.		Unit	Unit Price
28-5860	NEEDLES, DARNING, 10 in pkg.	pkg.	.25
28-5880	NEEDLES, KNITTING, 12 in pkg.	pkg.	.55
28-5900	PAN, Dissecting, 12" x 7-1/2" x 5/8" deep	each	1.20
28-5910	PAN, METAL, vitreous enamel, 16-3/8" x 10" x 2-1/8"	each	2.50
28-5920	PAN, METAL, vitreous enamel, 20-1/2" x 12-3/4" x 2-3/8"	each	3.64
28-5930	PAPER, BLUEPRINT, 5 x 7, 24 sheets	pkg.	.49
28-5940	PAPER, BLUEPRINT, 8 x 10, 24 sheets	pkg.	1.29
28-5960	PINS, SILK, #2, for mounting insects (100 per pkg.)	pkg.	.43
28-5980	PITH BALLS, 12	pkg.	.80
28-6100	PLANT FOOD, "Plantabbs", 100 in pkg.	pkg.	.20
28-6000	PLANETARIUM, Universal, shows day and night, seasons, length of day, phases of moon, earth-sun-moon phases, includes manual	each	24.00
28-6200	PLATES, glass, flat, 12 to pkg. 2" x 2" x 1/16" thick	pkg.	.30
28-6220	POTS, FLOWER, unglazed earthenware, 4" diameter	each	.10
28-6240	PRISM, equilateral, flint glass, 75 mm long	each	2.00
28-6300	PULLEY, double, Bakelite	each	1.15
28-6340	PULLEY, single, Bakelite	each	.80
28-6400	PULLEY, double tandem, Bakelite	each	1.55
28-6440	PULLEY, triple tandem, Bakelite	each	2.05
28-6500	PUMP, model, plastic, force	each	5.65
28-6540	PUMP, model plastic, lift	each	4.95
28-7000	RADIOMETER	each	.80
28-7140	RECEPTACLE, screw base, for incandescent lamp, miniature, item #28-4800 (unmounted)	each	.25
28-7145	RECEPTACLE, screw base, for incandescent lamp, miniature, (mounted on board with Fahnestock clips for easy connection) -- 2 lamps included	each	.94
28-7020	RAIN GAUGE, wedge shape	each	3.95
28-7300	ROD, FRICTION, glass, 300 mm x 13 mm	each	1.10
28-7340	ROD, FRICTION, hard rubber, 250 mm x 13 mm	each	.70
28-7360	ROD, soft iron (used as electromagnet core)	each	.25
28-7400	RUBBER STOPPERS, assorted sizes, 00-8 (solid, one-hole and two-hole)	2 lb.	2.40

BASIC SCIENCE SUPPLIES FOR ELEMENTARY SCHOOLS

Item No.		Unit	Unit Price
17-5800	SALT SHAKER, glass, for iron filings	each	.08
28-7480	SCALE, balance, spring dial type, 250 gms or 9 oz. capacity, Cenco 5410 - or equal, (to determine the weight of objects weighing less than one-half pound and small forces)	each	2.25
28-7490	SCALE, balance, spring, dial type, 500 gms or 18 oz. capacity, Cenco 5510 - or equal, (to determine the weight of objects weighing one pound or less and to measure small forces)	each	2.25
28-7500	SCALE, balance, spring, dial type, 2,000 gms or 72 oz. capacity	each	2.25
28-8000	SCIENCE KIT AND MANUAL, contains almost all necessary initial equipment for elementary science	each	42.00
28-8040	SILK PAD, exciting	each	.55
28-8200	SPOON, DEFLAGRATING, iron, 3/4" diameter cup, total length 15"	each	.26
28-8300	SUPPORT, iron, rectangular base, 4-7/8" x 8", w/rod	each	1.90
	SUPPORT, ring with clamp		
28-8400	2-1/2" inside diameter	each	.95
28-8500	3-3/8" inside diameter	each	1.05
28-8520	SWITCH, KNIFE (unmounted) single pole, single throw	each	.40
28-8525	SWITCH, KNIFE (mounted on board with Fahnestock clips for easy connection) single pole, single throw	each	1.13
59-0570	SWITCH, PUSH BUTTON (unmounted)	each	.50
28-8530	SWITCH, PUSH BUTTON (mounted on board with Fahnestock clips for easy connection)	each	1.08
28-8600	TELEPHONE RECEIVER	each	5.00
28-8640	TELEPHONE TRANSMITTER	each	4.00
28-8700	TEST TUBES, Pyrex, 6" x 5/8"	each	.0508
28-8740	TEST TUBE CLAMP (Holder)	each	.11
28-8800	TEST TUBE RACK, wood, 6 holes and 6 pins	each	.70
28-9000	THERMOMETER, Celsius, (Centigrade) laboratory type, (-10°C to 110°C)	each	1.80
28-9005	THERMOMETER, Celsius, (Centigrade) student type, (-30°C to 50°C) inexpensive thermometer mounted on plastic backing	each	.15
28-9040	THERMOMETER, Fahrenheit, laboratory type, (0°F to 230°F)	each	1.40
28-9050	THERMOMETER, Fahrenheit, student type	each	.15
28-9100	THERMOMETER, metal, protected bulb, white enamel, scale in black	each	1,08
28-9200	THERMOMETER, outdoor, metal, protected bulb, mounting brackets, swivel type	each	1.53
28-9300	THERMOMETER, wooden back, natural finish	each	1.20

Item No.		Unit	Unit Price
16-3420	THREAD, black No. 50	spool	.09
16-3520	THREAD, white No. 50	spool	.09
28-9340	TONGS, beaker, Fisher improved	pair	6.50
28-9360	TONGS, crucible, Parkerized steel	pair	.38
	TOOLS:		
32-4740	HAMMER, claw, 10 oz. head	each	2.24
28-4300	HAMMER, geologist, 22 oz. head	each	5.50
32-6300	PLIERS, combination, adjustable, 6"	each	.50
32-7460	SAW, HACK, adjustable	each	1.18
32-0930	BLADE, HACKSAW, 12", 14 teeth	each	.10
32-7550	SCREWDRIVER, 4" blade, Stanley #20	each	.71
32-8750	SHEARS, tinners snips, 3" cutting length, Wiss #9	pair	2.29
28-9400	TUBING, GLASS, lead-potash, 6 mm outside diameter	lb.	.55
28-9420	TUBING, RUBBER, 3/16", black	ft.	.27
28-9440	TUBING, RUBBER, 3/16", red	ft.	.27
	TUNING FORK, unmounted		
28-9500	128 vps	each	5.50
28-9520	256 vps	each	5.50
28-9540	320 vps	each	5.15
28-9560	384 vps	each	5.15
28-9580	512 vps	each	5.00
15-9200	TWEEZER, length - 4-5/8"	each	.31
12-8600	VERMICULITE	5# bag	.20
28-9600	VOLT-AMMETER, pocket type, DC, range 0-10 volts, 0-35 amperes	each	3.60
28-9640	WATCH GLASS, Pyrex, 75 mm diameter	each	.15
28-9700	WEATHER VANE, with base, metal, directions plainly marked	each	.83
28-9720	WEIGHTS, BALANCE, AVOIRDUPOIS, iron, class T, 1/2 oz. to 1 lb. (set of 8)	set	5.00
28-9740	WEIGHTS, METRIC, HOOKED, 10 gm - 1 kgm	set	14.25
28-9750	WEIGHTS, BALANCE, METRIC, in wood block, 1 gm - 500 gm	set	8.25
28-9770	WIRE, copper, annunciator, #22, vinylite covered	1# coil	2.34
28-9780	WIRE, iron, 17 gauge	4 oz spool	.34
28-9800	WOOD SPLINTS, 500	pkg.	.63

Item No.		Unit	Unit Price
	BIRD CARDS, Audubon, postal card size, 50:		
28-1100	Summer	box	1.20
28-1200	Winter	box	1.60
28-1300	Spring	box	1.60
28-1400	BIRD CHARTS, Audubon, 20" x 30", set of 4: Winter, Summer, Game Birds, and Birds of Prey	set	3.55
28-7200	ROCK CYCLE CHART	each	10.95
	ROCK COLLECTION:		
28-7210	KINDERGARTEN, 5 specimens to illustrate the Kindergarten concepts, each 3" x 3" x 2" (unmounted)	set	1.40
28-7220	GRADE ONE, 9 specimens to illustrate the First Grade concepts, each 3" x 3" x 2" (unmounted)	set	1.40
28-7230	GRADE FOUR, 9 specimens to illustrate the Fourth Grade concepts, each 3" x 3" x 2" (unmounted)	set	1.40

(Schools may purchase emergency supplies directly, paying for same out of the school building's funds. Principals are requested to accumulate receipts of at least five dollars ($5.00) and then make a general requisition (form G1000) to cover the items purchased. Attach all receipts and send the requisition to the Finance Department for reimbursement from the individual school's supply allotment.)